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TECHNICAL AND PRACTICAL OF MEDICINE

AN INQUIRY

INTO THE

PRINCIPLES AND PRACTICE OF MEDICINE.

AN INQUIRY
INTO THE
PRINCIPLES AND PRACTICE
OF
MEDICINE,

FOUNDED ON
ORIGINAL PHYSIOLOGICAL INVESTIGATIONS.

BY
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‘Quandò talis amentia et abusus cessaturus est? et quandò aurea mediocritas et sobrietas in territorio medicorum triumphatura?’—SCHMIDTMANN *Sum. obser. med.*

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—
1834.



TO

SAMUEL BAILEY, Esq.

AUTHOR OF

ESSAYS "ON THE FORMATION AND PUBLICATION
OF OPINIONS," &c. &c.

AS A HUMBLE

TRIBUTE OF RESPECT AND THANKFULNESS

FOR HIS

DEPTH AND ACUTENESS OF THOUGHT,—

HIS ZEAL AND FIRMNESS IN THE DISCOVERY AND
EXPOSITION OF TRUTH,

AND THE HIGH AND PURE EXAMPLE OF
MORAL WORTH DISPLAYED IN ALL HIS WRITINGS,

THIS VOLUME IS

MOST RESPECTFULLY INSCRIBED,

BY HIS FRIEND,

G. CALVERT HOLLAND.

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ERRATA.

- P. 24, line 26, instead of "hypothesis" read "hypotheses."
- 33, line 19, instead of "medicine" read "medicinal."
- 51, see definition of animal heat, p. 317, and Note A., Appendix.
- 141, line 23, instead of "catemema" read "catamenia."
- 164, line 4, instead of "exciting" read "exerting."
- 378, line 3, instead of "cholera," read "disease."
- 403, instead of Chap. "XV." read Chap. "XVI."
- 408, line 18, instead of "?" read "!"
- 453, line 11, instead of "explains" read "explain."

INTRODUCTION.

THE explanation which the principles advocated in the following pages afford, of numerous morbid phenomena, and the practical views they suggest, originated in the investigation and discovery of the laws of organic and animal life, which have been developed, at some length, in a previous publication.* A knowledge of these laws will clearly shew their intimate and important connexion with the science of medicine, not merely with one of its departments, but its whole range, scope and tendency. The more closely, indeed, these laws are considered, the more evident will it appear, that this science can be

* Experimental Inquiry into the Laws of Organic and Animal Life.

placed on a sure foundation, only by first ascertaining the direct and indirect influence of the functions of organic and animal life in health, and then endeavouring to determine in what manner they are liable to be disturbed by different external and internal agents. That this is the proper mode of procedure is too obvious to be called in question by any one: though it is evident from a majority of practical works on medicine, that it has not been generally recognised, or adopted to a proper extent. Writers on this science, in their most felicitous efforts, have too frequently been satisfied with the knowledge of some single principle of the animal economy, that never led them to form a just conception of the *general* laws which regulate the well-being of the vital powers. They have, indeed, pursued the plan which HUME condemns in the following very striking remarks, which apply with as much force to the study of the science of medicine, as to that of any other which this distinguished philosopher might have in

view. “Here, then, is the only expedient from which we can hope for success in our philosophical researches ; to leave the tedious lingering method, which we have hitherto followed ; and instead of taking now and then, a castle or village on the frontier, to march up directly to the capital or centre of the sciences, to human nature itself ; which, being once masters of, we may every where else hope for an easy victory. From this station we may extend our conquests over all those sciences, which more intimately concern human life, and may afterwards proceed, at leisure, to discover more fully those which are the objects of pure curiosity.” To endeavour to march up directly to the capital or centre of medical science, *to a knowledge of the general functions of the animal system in health, and of the particular mode of their disturbance in disease, has been the object of the following physiological investigations ;* how far that object has been attained it is for others to determine. The investigations which have led to the dis-

covery of important laws belonging to the animal system, and the attempt to apply them to the explanation of the origin, progress, and termination of disease, may be regarded as too closely connected with those refined speculations, which, though attractive to the philosopher in his closet, possess little interest for the practitioner who is chiefly occupied with the active duties of his profession. Practical knowledge, however, is empirical, unless it be the result of an intimate acquaintance with the laws of the animal system, and a competent knowledge of those laws cannot be communicated to any one, without leading the understanding through the various steps of inquiry, which have conducted to important conclusions, detailing the facts by which they are supported, and pointing out the different circumstances which must modify the employment of the remedial measures suggested by them. The mind must, however, be long inured to patient thought and laborious investigation before it will submit

to this analytical mode of studying nature, or before it is capable of deriving from it all the advantages of which it is susceptible. It has been my object in this work to throw out, as it were, at once, the *elements* of physiological science strictly applicable to the practice of medicine, shewing generally in what manner the former may be made subservient to the improvement of the latter, but necessarily leaving the full development of many important principles to subsequent investigations when particular diseases will be considered. The reader must not, therefore, expect to find in this volume a complete elucidation of the various morbid affections repeatedly glanced at in the course of it, as it contains only the rudiments of explanatory principles whose evolution will be gradual, depending on the slow process of analytical investigation. If these principles, however, be founded in truth, they will necessarily receive corroborating evidence from every fresh application of them to the explanation of the origin, progress, and

treatment of disease ; but if they are erroneous, the novel positions and relations in which they are placed, will inevitably expose their fallacy. With these remarks the Author concludes, trusting, that if this work, which has long occupied his thoughts, falls far short of the excellence which it ought to possess, and of which, he believes, the subject of it would be susceptible in abler hands, the impartial reader will give him credit for honesty of purpose, and a sincere desire to promote the important objects of his profession, by an undeviating and laborious search after truth.

CHAPTER I.

INQUIRY INTO THE PRINCIPLES AND PRACTICE OF MEDICINE.

SECT. I.

*The imperfections and errors in the prevailing
Systems and Doctrines.*

IT is not my intention, in this Section, to give a complete exposition of the various errors in the different systems and doctrines which influence the practice of Physic in the present age : since such an exposition would require more space and time than ought to be devoted to the consideration of opinions which may be justly regarded as decidedly fallacious or objectionable. If the general principles laid down, in this Treatise, and in other Treatises that will shortly follow it, be satisfactorily established, the fallacy of numerous hypotheses, scarcely of

sufficient importance to merit each a separate notice, will follow as a matter of course. It is, therefore, only necessary here to allude to such as are calculated to exert an extremely prejudicial influence, in consequence of their general prevalence and supposed importance, their specious and imposing character, or the highly respectable individuals with whom they have originated.

The exposition of errors of this kind is almost essential to the proper understanding and just appreciation of sounder principles, which, being founded on a more intimate acquaintance with the natural functions of the animal system, apply more generally to every disordered state of the body, and suggest a mode of practice in the treatment of disease more simple, decisive, and effective, than that which is commonly adopted. It is much more agreeable to point out excellencies than defects ; but it is the duty of the philosophical inquirer, unbiassed by party views or illiberal feelings, to notice both in the manner they deserve, that what is erroneous may be corrected, and what is really founded in truth may be held up to the admiration of mankind. “I reverence as much as any man,

the great intellects which have been employed in raising the structure of science. It is no disparagement to the illustrious men of past times, that their errors are pointed out, and that shorter and easier methods are found of accomplishing that which it required all their efforts to effect. With intellects far greater, perhaps, than any subsequent labourers in the same cause, they may be surpassed in extent and accuracy of knowledge, at a later period, by men of the most limited capacity. Such is the necessary condition of human improvement. All that an individual can effect is comparatively trivial. His powers of original inference are bounded to a few steps. The works of one must be elevated on those of another ; meanwhile beauty of style, elegance of illustration, perspicuity of arrangement, and ingenuity of inference — all that constitutes a book, a work of art, may be imperishable.* To the justness of these remarks every enlightened mind will assent. They are the observations of an author whose writings are destined to exercise considerable influence on the literature and science of this country ; displaying

* Essays on the Pursuit of Truth, on the Progress of Knowledge, and on the Fundamental Principle of all Evidence and Expectation. Page 137.

great clearness and comprehension of judgment, delicacy of taste and elevation of moral feeling, and by their tendency to destroy ill-founded prejudices, to correct narrow and partial views, and to excite in the scientific inquirer a candid and liberal spirit, are eminently calculated to promote the cause of truth.

Humoral Pathology, of which so much was said in former times, has become now entirely obsolete, at least that part of the doctrine “which attempted the explanation of animal phenomena by the conflicts or harmonies of spherical or angular particles, by their adaptation to tubes of different calibre, by their remoræ, their mobilities, their errors of place, by their salt or oily qualities, by fluid particles which made acrimonious humours, and mucilaginous ones which served to obtund them. These fantasies are now pretty generally rejected, and even the addition of an acid and an alkaline nature to the fluids in question, the fermentations resulting from the conjunction of opposing influences, their attractions and repulsions, their conditions both peccant and laudable, together with all the hints derived from planes, levers, and screws, have not been sufficient to save this ingenious

pathological structure from falling into that state of dilapidation and ruin, which sooner or later is the fate of all things human.”* Every system of medicine, however widely one may be opposed in principle to another, is more or less replete with valuable facts, with suggestions and observations that lead to the detection of pernicious errors, or the establishment and illustration of useful truths. These remarks may be applied with great justice to Humoral Pathology, which, though abounding in the most ridiculous notions, bold assumptions, and crude fancies, is founded on much that is true. It attempts to explain the origin and nature of diseases by changes produced in the properties of the blood, and it cannot for a moment be doubted, if the principles laid down in the following pages be correct, that this opinion is supported by many striking facts.

The qualities of the blood, as every enlightened physician has observed, are undoubtedly modified in various bodily affections: at one time the circulating fluid is exceedingly black and unsusceptible of coagulation, at another

* PRING'S Principles of Pathology. Page 2.

it is highly florid, and coagulates almost as soon as it is drawn from the veins ; it is also subject to many other variations, to all of which a strict attention was formerly paid, when the employment of remedies was in a great measure regulated by the alterations that took place in the state of this fluid. Speculative and enquiring minds vainly endeavoured to ascertain the precise character of the morbid changes in the blood ; some attributing them to the predominance of an acid or alkali, others to causes which were supposed to produce a watery or putrescent condition of it. Even in the present day, any attempt to discover the nature or origin of these particular modifications, with all the aid to be derived from the useful and extraordinary discoveries of analytical chemistry, would perhaps afford no satisfactory or practical result. The means which have hitherto been employed to correct the disorders of the blood, were not at all adapted to effect this object, because they were not accommodated *to the nature of those causes which regulate the chemical and vital properties of this fluid.*

Humoral Pathology, by directing the attention to certain manifest derangements of the sanguiferous system, gradually led to the dis-

covery or elucidation of many important truths, either entirely or partially lost sight of in opposite doctrines and opinions, which have been of essential service in promoting the progress of Medical Science. As, however, the supporters of this system had a very imperfect acquaintance, if any at all, with the influence of those functions which directly modify the properties and distribution of the blood, and no just conception of the manner in which disease is occasioned by any general changes in it, the principles they endeavoured to establish were necessarily either too confined in the application, or altogether erroneous. Although it is incorrect to refer the origin of all diseases to alterations in the qualities of the blood, it is, nevertheless, easy to adduce numerous facts and striking illustrations to prove, that many of the maladies with which the human frame is affected, if not the greater number, are to be traced to this cause. The Solidists, who contend that diseases originate in alterations of the animal structure, deviate almost as widely from the truth as the Humorists, and although the doctrines they teach are characterized by fewer absurdities and assumptions, they yet exhibit the same limited knowledge of the more important functions of

the body, a thorough acquaintance with which, is as essential to the establishment of their own principles, as those of the Humoralists. In consequence of their ignorance of these vital functions, (an intimate and accurate knowledge of which can alone explain the cause of any morbid effects in the system, or suggest the means by which they may be removed,) it is impossible for them to understand how diseases of structure influence the qualities of the blood, or how any disorder in it is the occasion of functional and organic derangements.

The genius of CULLEN, although he was a decided Solidist, has betrayed him into fewer inconsistencies and inaccuracies than generally abound in the writings of others who entertain the same opinions ; there are, however, in his *Physiology and Practice of Physic* serious errors, which constitute, indeed, the ground-work of his principles and reasoning on these subjects. His doctrine of spasms, his *vis medicatrix naturæ*, and his notions respecting the functions of the nervous system, which all form an integral part of his writings, are either altogether false, or possess too little truth to promote the advancement of Medical

Science. It has been shewn in the “Experimental Inquiry,”* that the phenomena, which he endeavours to explain on the doctrine of spasms, may be satisfactorily accounted for on much simpler principles, and that many diseased states of the body to which his doctrines do not apply, are, moreover, fully elucidated by taking into consideration the changes in the properties and distribution of the blood which are occasioned by external or internal causes.

It is scarcely necessary to allude to his *vis medicatrix naturæ*. The belief in the *separate* existence of such a power is now universally exploded ; it is wonderful, indeed, that it should ever have been credited, since CULLEN never explained its production and operation, subjects that have been treated somewhat at large in the “Experimental Inquiry,” as well as in the “Physiology of the Fœtus.”† His fallacies respecting the nervous system are numerous, but a complete exposition of them could not be given without entering into a

* An Experimental Inquiry into the laws which regulate the phenomena of organic and animal life. Edinburgh, printed for Mac-lachlan and Stewart ; and Simpkin and Marshall, London, 1829.

† The Physiology of the Fœtus, Liver, and Spleen. London, printed for Longman, Rees, Orme, Brown, and Green, 1831.

full examination of the particular applications of his doctrine—an examination which I shall postpone to a subsequent occasion, making here only a few general remarks on the principles stated in the following passage :—
“ The remote causes of fever are certain sedative powers applied to the nervous system, which, diminishing the energy of the brain, thereby produce a debility in the whole of the functions, and particularly in the action of the extreme vessels. Such, however, is, at the same time, the nature of the animal economy, that this debility proves an indirect stimulus to the sanguiferous system ; whence, by the intervention of the cold stage, and spasm connected with it, the action of the heart and larger arteries is increased, and continues so till it has had the effect of restoring the energy of the brain, of extending this energy to the extreme vessels, of restoring, therefore, their action, and thereby especially overcoming the spasm affecting them ; upon the removing of which the excretion of sweat and other marks of the relaxation of excretories take place.”*

1st. There is no evidence whatever to prove

* Practice of Physic, ch. x, p. 56.

that the energy of the brain maintains a direct correspondence, in the sense intended by CULLEN, with the more important organs of the body, or that any debility of the cerebral functions is immediately communicated to them generally, or to the extreme vessels in particular.

2nd. It is easy to shew that the causes which depress the action of the brain enfeeble, at the same time, the whole nervous system in consequence of the great and extensive influence they exert on the frame.

3rd. The unquestionable changes that take place in the properties and distribution of the blood, in the different stages of the disease, to which he alludes in the preceding remarks, will satisfactorily account for all the phenomena he enumerates. It is, indeed, somewhat extraordinary, that the line of practice suggested by the hypothetical notions of CULLEN is, in many instances, precisely the same in character as that which would naturally be adopted by the advocate of opposite views of a more sober and rational kind.

There is one important difference between

the practice of the mere theorist, however fortunate it may chance to be, and that of him who is guided by well-established and invariable principles; and this consists in the greater promptitude and decision which, in all extreme or doubtful cases, will be manifested by the latter, these qualities, often essential to the recovery of the patient, being the result only of such principles. In CULLEN's theory of fever, spasms of the extreme vessels form a prominent part, and will furnish an illustration of the justness of these animadversions. To remove or lessen the disordered state of the capillaries, was the great object of his practice; for he found, from experience, that the severity of the disease was diminished in the same proportion as this end was accomplished. Now, according to the principles developed in the "Experimental Inquiry," it is clear, that the qualities and distribution of the blood are generally improved by the means which he employed to relax the spasms, and, consequently, the great relief conferred by those means on the vital powers, is not attributable to the particular modification he describes, *but to the extensive and numerous changes produced in the sanguiferous system.* That the means, which he prescribes, operated generally, and not par-

tially, is evident from their nature, but how slight and inefficient must their influence be, when the application of them is regulated by such false and imperfect notions, compared to what it would be if uniformly directed by clear, enlarged, and well-established principles !

It thus appears that in acting agreeably to the hypothetical opinions of CULLEN, whether in the employment of internal or external remedies, the severity of disease will frequently be mitigated, not because those opinions were correct, but because the means he used exercise a more extensive influence than was imagined by this enlightened physician, and in a manner too of which physiologists, in his own day, could form no just conception. It must, indeed, be acknowledged, that his own practice, under the direction of acute observation and long experience, was, in many instances, altogether free from the trammels which his particular notions imposed upon that of others ; it is, however, susceptible of considerable improvement, but in what way, and to what extent, are subjects which subsequent investigation must determine. In these observations I have glanced at only a few errors,

many more might be pointed out, arising from other principles, as well as from those already stated; but, as the exposition of them individually does not fall within the legitimate province of this inquiry, I shall pass them over altogether. If it were even admitted that the doctrine of CULLEN is founded in truth, it but very imperfectly explains numerous phenomena succeeding a slight or severe disturbance of the vital powers.

It throws little, if any, light on the various causes of the many diversified forms of disease, and it does not account for the same measures being inapplicable in cases characterised by similar symptoms.

It does not appear to be the result of any intimate acquaintance with the natural actions of the body, nor does it imply any knowledge of the laws of animal heat, the moving powers of the blood, the function of digestion, the distribution of the vital fluid at different seasons, the operation of the remedial agents generally, and many other intricate subjects of almost equal importance. On the nervous system, since the time of CULLEN, many ingenious minds have attempted to establish doc-

trines that have been supposed to unravel some of the great mysteries of the animal economy, such as the principle of life, the function of secretion, the influence of the maternal imagination on the fœtus, the origin of disease, the manner in which the emotions of the mind affect the body, the influence of all sympathetic actions, and various other phenomena. Our knowledge of the nervous system is extremely limited. We cannot say even in a single instance, how any of its respective functions are performed. We know that motion and sensibility are properties with which it is endowed, bestowed in various proportions on different parts of the body, according to the structure and function of the organ to which they are given ; and we, also, know, that the five senses, and the intellectual faculties, perform their several operations by or through the instrumentality of this system. We are, however, in possession of no facts which prove that secretion, digestion, or assimilation is directly dependent upon it, or that it in any way directly contributes to the exercise of these powers. It is generally supposed, and by some broadly asserted, that the ganglionic system of nerves, in consequence of the numerous organs to which its ramifications extend,

occasionally produces considerable internal disease, spreading from it, as from a centre, to the contiguous viscera. Various doctrines and opinions have of late years been entirely founded on this particular system of nerves. No satisfactory evidence, however, is adduced to prove that it exerts the degree of influence attributed to it. There is not, indeed, one fact which plainly demonstrates the existence of any such influence, or renders it even probable. That the nerves of this system are sometimes in a decidedly morbid state, when much general or local disease exists in other organs, is unquestionable; but this circumstance, unless it can be clearly shewn that the nerves were primarily affected in all such cases, may be brought forward, with as much reason, to prove that it is the effect of some other disorder, either altogether overlooked or imperfectly understood, and not the cause of the derangement co-existing with it.

If it were possible to prove that these nerves directly influence the functions of secretion, digestion, and assimilation, it might then be affirmed, that any morbid action in them is immediately communicated to other parts of the body, producing general or local disease.

It must, however, be acknowledged, that physiology furnishes no such facts. The following opinions, lately advanced by Mr. BELL, in his Treatise on Cholera, will afford, if I am not mistaken, an illustration of the justness of these animadversions :—" In cholera," he observes, " in the very outset of the disease, all secretions, properly so called, are found to have failed ; the alimentary ejecta are not gastric juice, pancreatic fluid, bile, mucus, or excrementitious matter. The kidneys cease to secrete urine ; saliva no longer flows into the mouth, nor are the eyes moistened with tears, carbonic acid gas is not thrown off in its usual quantities from the lungs, and animal heat is not evolved in the body. Here, then, is a disease which consists of a suspension of a great class of involuntary functions, and it appears to be a fair conclusion, that its immediate cause is to be sought for in the nervous system. At this stage of the inquiry the question occurs,—How can a disease be considered a nervous failure in which we find the sensorium, the respiratory, and the voluntary powers unaffected ? The answer to this difficulty may be comprehended in the following propositions, which embody the conclusions on this subject at which the author has arrived :—

“1st. The great ganglionic, or sympathetic system of nerves is possessed of a power wholly unconnected with cerebral influence, which it may retain after the brain and spinal marrow are removed, and which may exist while these retain the full exercise of their functions.

“2d. To this system belong the circulation and distribution of blood, and it, consequently, has a most important share in regulating secretion, and carrying on the involuntary functions.

“3d. To the suspension of this power of the system, is to be ascribed the disease which has obtained the name of cholera asphyxia. The symptoms of cholera asphyxia, throughout its course, must be referred to the condition of the circulation. At whatever period of the disease the state of this important function is examined, it is found to be morbidly affected.”*

How Mr. BELL should arrive at the conclusion, that the sensorium, the respiratory, and the voluntary functions are unaffected in cholera is somewhat extraordinary: yet the whole of his reasoning is founded on this as-

* *Lancet* 429, vol. I., 1831, p. 257.

sumption. It has, however, in numberless instances, been proved by dissection, that the brain is frequently diseased, and, even during life, an evident derangement of its several functions is often indicated by striking symptoms. It is difficult to conceive how the action of the respiratory powers has been regarded as natural in this disease, since *post mortem* examinations have repeatedly shewn that the lungs are very often considerably congested, being occasionally as firm in substance as the liver itself.

The irregular breathing, frequent sighs, and moanings of the patient manifestly indicate great disturbance of the respiratory organs. I have observed, in many instances, various symptoms strongly characteristic of disorder of the brain, but these, as well as many other points, will be more particularly considered in the subsequent pages. The erroneousness of Mr. BELL'S conclusions does not, however, depend on the correctness of these strictures.

It is stated, in the passage quoted above, that the circulation is, from the commence-

ment of the disease, disturbed, and that the morbid action of the ganglionic system of nerves is the occasion of it. It has been proved in the "Experimental Inquiry," that whenever the blood becomes *internal* in its distribution from the influence of cold, sudden depressing emotions, or any other cause, a derangement consequently takes place in the sanguiferous system, in which modifications occur similar to those that appear in well marked cases of cholera. If the phenomena can, in one instance, be explained, without any gratuitous assumptions, it is certainly reasonable to infer that they may in another. The *internal* character of the circulation may be explained without supposing that the ganglionic system of nerves is primarily diseased. It may be satisfactorily accounted for on other principles, which have been stated at length in the work just mentioned, and which, in the present Treatise, will receive additional confirmation from their application to various diseased conditions of the body, such as the black appearance of the blood, the diminished generation of animal heat, and the morbid secretions generally in cholera, as well as in other affections, all

of which they will easily explain, without any reference whatever to the ganglionic system of nerves.

The passage just quoted from the Treatise of Mr. BELL, affords a striking specimen of the assumptions that are boldly hazarded in the science of medicine by men of learning and intelligence : the human mind being naturally too much disposed to seize, with avidity, whatever seemingly offers an explanation of phenomena involved in mystery, or imperfectly understood. The "Study of Medicine," by MASON GOOD, has acquired a reputation which it by no means deserves. It does not contain any new and excellent principles calculated to advance the progress of medical science, nor is it distinguished by acute observation and close reasoning. The talents of its author were not, indeed, those of an original thinker, or profound reasoner ; but his patience and industry in the acquisition of knowledge, well qualified him to communicate it to others. Although he has contributed little that is new, except in nosological nomenclature, the value of which is extremely questionable, he has, nevertheless, a claim on our gratitude for the able manner in which he has executed the

laborious and useful task of compilation, which serves materially to promote the cause of science by presenting, in a compendious form, all that is really known and valuable on many different subjects. The abilities of the compiler, however successfully employed, cannot be regarded as directly accelerating the progress of truth, giving it an impulse which carries it beyond its circumscribed boundaries, though they may diffuse more widely what is known, and thus excite to active thought numerous minds, whose energies would, perhaps, but for such excitement, have been either misdirected, or but partially developed.

Compilations are frequently injurious in medicine, which, unlike the exact sciences, contains few principles and facts that can be fearlessly laid down to regulate the conduct of the profession generally, not so much in consequence of its nature, as of our limited and imperfect knowledge of the laws of the animal economy, which may, perhaps, ere long be much better understood. In the mean time works of this kind will necessarily promulgate and continue many serious errors and prejudices, and thus retard the progress and establishment of truth.

The “Study of Medicine” is open to much censure in this respect. It is supposed to be founded on physiological principles in a greater degree than works on medicine generally are, and hence it is imagined that the phenomena of disease are more lucidly and accurately explained than in other medical Treatises—that the various functions of the system are more clearly elucidated, and the remedies proposed more worthy of adoption.

Such is the impression of the public in regard to this work—an impression which has been produced by the physiological proems prefixed to each class of diseases, descriptive of the organs and functions particularly affected by them as well as by the nomenclature of the several diseases themselves : but the merits of the “Study of Medicine” have been over-rated : it has not enriched the science by any important facts, and its superiority to the first lines of CULLEN consists chiefly in recording the different discoveries in medicine, and the collateral sciences, which have been made since the publication of that truly valuable treatise. These, however, are not sufficiently numerous, or important, to suggest any considerable modifications of the theory or altera-

tions in the practice of physic. They communicate no new information respecting the manner in which the circulatory system is influenced by external and internal causes ; they explain not how the properties of the vital fluid are thereby affected, and how changes induced in it operate on the whole or any part of the organized system.

Without a knowledge of these, and other facts, scarcely less valuable, the advancement of medical science will necessarily be slow and uncertain. The physiological proems of MASON GOOD have no intimate relation to the body of his work, and have, indeed, so little connexion with it that they might be published separately as a sketch of physiological science, without the medical department suffering any material injury. The proem which precedes the examination of the diseases of the digestive function, will be found, on perusal, to justify the severity of these strictures. It treats of the peculiarities in the organization of the digestive apparatus in different animals, of the omnivorous power which some of them display, of the antiseptic agency of the gastric juice, of the hypothesis concerning the manner in which digestion was formerly supposed

to be effected, and of several other subjects which throw no light whatever on the origin, progress, and nature of the diseases, the consideration of which it precedes, nor does the proem suggest any principles superior to those which regulate the practice of the greater part of the profession, elucidate any of the functional relations existing between the stomach and other vital organs, or furnish any explanation of the mode in which the disordered action of one communicates its injurious influence to others, giving rise to much general disease, or in which the chylopoietic viscera are acted upon by changes in the distribution and properties of the blood.

It is scarcely possible to conceive a greater difference, as far as regards the extent and accuracy of physiological and pathological principles, than that which exists between the medical works of BROUSSAIS and the "Study of Medicine." The former display an enlarged and generally correct knowledge of the natural laws of the animal economy, and the origin of the diseases, of which they treat: and it may here be observed, that physiological and pathological views are in them so intimately connected, that a close attention to both is absolutely necessary, without which it would

be impossible to understand the mode of treatment recommended by BROUSSAIS, and his explanations of the operation of many important remedial agents.

It must not, however, be understood from these remarks, that he has laid down principles so extensive as to explain the manner in which the numerous external and internal causes influence the more vital functions, how the disordered action of one disturbs the rest, or the precise mode in which many of the curative means affect the powers of life : still less is this general praise to be construed into an approval of his particular notions respecting the seat, nature, and treatment of various diseases. It must, however, at the same time, be acknowledged, that the works of BROUSSAIS are disfigured by fewer errors than most others on subjects connected with the science of medicine. They abound in facts of inestimable value—in reasoning generally clear and philosophical, and in incidental remarks, such as could proceed only from a mind endowed with original powers of no ordinary character.

The science of medicine has, undoubtedly, been much retarded in its progress by a cir-

cumstance that is generally thought to accelerate it : I allude to the publication of medical cases, brought forward in corroboration of the accuracy of the various views, entertained by different practitioners, of the nature of diseases, and of the efficacy of the means employed in the treatment of them. Cases, when drawn up by one possessed of a vigorous and enlightened mind, not easily led astray by seeming analogies, or by a few unconnected facts, may be justly regarded as the likeliest means of promoting the establishment of sound principles in the science of medicine ; but, when given to the world, as they too frequently are, by individuals destitute of the qualifications necessary to draw from them general and fixed principles, by a reference to which its future advancement may be promoted, they are decidedly injurious to the steady promotion of truth. They may be adduced in favour of the most improbable or absurd notions, by which, when apparently strengthened by an appeal to facts, by instances of recovery under a certain mode of treatment, or by appearances on dissection, it is somewhat difficult to avoid being influenced, although they may be altogether unworthy of notice.

These seeming facts, which are urged in answer to many just objections, often give a wrong bias to the mind in its investigations. BROUSSAIS, for example, refers those who doubt the correctness of his opinions on Gastro-enterite to a species of evidence, which he considers indisputable, viz. pain on pressure of the epigastric region, the relief afforded by the application of leeches, or the traces of disorganization discovered after death in those viscera which were regarded during life as alone affected. CLUTTERBUCK, in support of his peculiar views, respecting the seat and nature of fever, fearlessly points to appearances in the brain, on dissection, in corroboration of their correctness. SWAN, who contends that mercury affects the system through the ganglionic nerves, adduces direct experiments in favour of this opinion. ABERNETHY, who considered the derangement of the digestive organs as the fruitful source of much local and general disease, supports his argument by numerous cases, which seem to place it in a secure and commanding position.

In the present day cases are triumphantly appealed to in support of new or particular doctrines, the absurdity of which would be

readily acknowledged, if the evidence, which experience is said to furnish in their favour, was not continually brought forward in confirmation of their accuracy—evidence, however, so hastily seized upon, and so incapable of any definite application, that no just conclusions can be legitimately drawn from it. It cannot, for a moment, be doubted, that BROUSSAIS, CLUTTERBUCK, and SWAN, observed the effects they describe, but it would be no difficult matter to prove, were this the proper place and time for adducing such proof, *that these effects furnish no direct evidence in favour of the truth of their opinions*, because it may be shewn, that they neither invariably take place, nor are confined only to those particular organs which they are supposed to disorder, but extend more or less to all parts of the system. Although strong objections may be urged against the prevailing rage for collecting cases, it must, at the same time, be acknowledged, that the abuse of this practice, and the numerous errors, arising from it, are in one way serviceable to the establishment of sound principles. When the philosophic mind perceives that the nature and seat of a disease are subjects warmly contested, each side referring to similar facts in corroboration of their

own particular views, such as appearances on dissection, and the good resulting from a certain mode of treatment, it is strongly excited to investigate the cause of this difference of opinion, and it seldom fails to discover that both parties are right and both are wrong—right in the individual facts by which they attempt to support their different systems, but wrong in the exclusive doctrines founded upon them.

The great difficulty in the science of medicine is to discriminate clearly between causes and effects. The labour of a whole life devoted to this investigation has hitherto been found insufficient to afford even a moderate acquaintance with them: the inefficacy of such labour is not, however, to be attributed so much to the abstruse, or inscrutable, nature of the things sought, as to the great and prevalent ignorance of the general laws of the animal economy — such, for instance, as those which regulate the generation of animal heat, the propulsion and distribution of the blood, the changes in the secretions, the properties and influence of the nervous system. The light which physiology has, of late years, thrown upon these important subjects, will

enable us, in most cases, to introduce a proportionate degree of improvement, and certainty, into the practice of medicine. I have already, in the "Experimental Inquiry," fully explained the manner in which the mind affects the body, and hence it is now comparatively easy to ascertain the true causes of the many evils arising from distressing emotions, whether they be of long or short continuance. Persons have at one time died suddenly, at another after lingering a few days, from the effects of fear; in both cases the blood has been found after death extremely dark coloured, either coagulating with difficulty, or not at all. When, however, the mind is less violently disturbed, the health gradually declines, the body loses its vigour, the countenance has no longer a clear or ruddy hue, and disease shortly makes its appearance either in the chest or abdomen, or in both. It would be impossible, were we to be guided in our decision by prevailing notions, amidst the various morbid effects apparent at the same, or different times in the system, to fix on any particular organ as the cause of them. The origin and extension of disease have, however, generally been accounted for by referring them to some such organ. The

stomach, the lungs, the liver, and a deranged condition of the nervous system, have been each regarded as the primary seat of disease, by the advocates of different systems, all of whom, in support of their own, have brought forward a number of facts seemingly conclusive and satisfactory, so that it is extremely difficult for the scientific inquirer to determine which of the several opinions is correct.

It has been shewn in the “Experimental Inquiry,” that distressing emotions disorder, in the first place, the distribution of the blood, in consequence of which the internal organs generally receive a greater proportion than usual ; and it has been further proved, that the circulating fluid is, under such circumstances invariably, less oxygenated than it is in a natural state. Two important circumstances then, are clearly ascertained, viz. *derangement in the distribution of the blood, and its consequent deterioration in the properties necessary to support life.* By such derangement and deterioration the whole system is more or less affected, as the functions of every part of it are necessarily disordered by them, but some will be more so than others, in consequence of their situation and nature ; and the number and

severity of the morbid conditions which may ultimately be produced, will be in proportion to the influence which the organ affected exerts on the system. That the lungs in one person, and the liver in another, should be principally diseased is attributable to causes which it is impossible to discover, the knowledge of which, however, is scarcely essential to the establishment of sound practical views. The physiological principles to which I can here only briefly allude, satisfactorily explain the phenomena of indigestion, as irregular action of the bowels, pain in the head, a pale or jaundiced expression of the countenance, a small and frequent pulse, and many other circumstances, which it is not necessary to enumerate, all of which are occasionally produced by mental influence: they also point out in what way the medicine agents employed are beneficial or injurious, and thus remove much of the mystery which has hitherto involved these subjects.

In the preceding pages I have animadverted generally on a few of the errors in the prevailing systems and doctrines of medicine, and have, also, alluded to their imperfections. By the imperfections of these systems and doc-

trines I would be understood to mean, that the principles on which they are founded, even were they correct, would not be sufficient to explain, in a satisfactory manner, the origin, progress, and nature of disease, the operation of the most active and commonly employed remedies, and the influence of many circumstances on the animal economy. First, they have certainly failed to explain how the properties and circulation of the blood are modified by—

I. EXTERNAL STIMULANTS GENERALLY.

- 1st. Heat of Summer,
- 2nd. Artificial heat.
- 3rd. Exercise.
- 4th. Friction.
- 5th. Stimulants or irritants.
- 6th. Galvanism and electricity.

II. INTERNAL STIMULANTS GENERALLY.

- 1st. Exhilarating emotions.
- 2nd. Influence of the respiratory organs exercised in speaking or vomiting.
- 3rd. Spirituous or Medicinal Agents.
- 4th. Bleeding.

III. EXTERNAL SEDATIVE.

- 1st. Cold.

IV. INTERNAL SEDATIVES GENERALLY.

- 1st. Depressing emotions.
- 2nd. Inhalation of noxious gases.
- 3rd. Sedentary pursuits.

- 4th. Cold liquids.
- 5th. Medicinal Agents.
- 6th. Nausea.
- 7th. Bleeding.

V. DISEASES.

- 1st. Inflammatory diseases.
- 2nd. Congestive diseases.

VI. THE PREVAILING SYSTEMS HAVE NOT EXPLAINED THE MANNER IN WHICH CHANGES IN THE CIRCULATORY SYSTEM INFLUENCE THE FUNCTIONS OF ORGANIC AND ANIMAL LIFE.

VII. NEITHER HAVE THEY EXPLAINED THE RELATIONS THAT ARE MAINTAINED THROUGHOUT THE ANIMAL SYSTEM BY MEANS OF THE SANGUINEOUS FLUID, NOR THE NUMEROUS PHENOMENA WHICH A KNOWLEDGE OF THIS SUBJECT ACCOUNTS FOR.

VIII. NOR THE LAWS WHICH REGULATE THE GENERATION OF ANIMAL HEAT.

Can it then be doubted that those systems and doctrines are imperfect, that but very partially explain these matters, which are of the utmost importance to a thorough understanding of the nature of disease, the means best calculated to cure or alleviate it, and the causes that produce or extend it? Without an extensive and intimate acquaintance with these subjects, the Science of Medicine cannot be regulated by any general and settled principles—such principles as alone can enable the

mind to perceive at once the primary and secondary causes of disease, and the remedies best adapted to its cure. If the errors and imperfections in popular systems and opinions, noticed in these pages, be acknowledged to exist, the exposition of them ought not to incur the charge of presumption, especially as original views are offered to the scientific inquirer for his close examination, which appear to be founded on a more accurate knowledge of the animal economy. This, however, is not the place for adducing in support of these views the smallest part of that large body of evidence that might be brought forward in proof of their correctness: indeed to elucidate, and completely establish them, would require a careful and minute investigation of the whole circle of medical science, with a constant reference to the original principles on which the present inquiry is instituted,—an investigation to which I shall devote all the energies of my mind, till it is conducted to a full and satisfactory conclusion.

SECT. II.

How far, and in what manner, the Study of Physiology facilitates the establishment of sound principles and correct reasoning in the Science of Medicine.

THAT an intimate acquaintance with physiology has not been more generally cultivated by the medical profession may probably be attributed to the following causes : the slight degree in which it has been made to bear on practice—the uncertainty of its doctrines, and the many fanciful and absurd notions with which they are evidently intermixed. Important truths in science lie not on the surface, attracting attention by their obviousness, but are deeply buried beneath it, requiring the labour of successive ages, and the concentrated exertions of many minds, to discover them. The process by which they are evolved is, therefore, necessarily tedious. The facility

with which this process is accomplished, will be proportionate to the success of the scientific inquirer in observing and explaining individual facts, in tracing out the particular relations they hold to each other, or the general principles by which they are connected together. Until science, whatever be its nature, is freed from the mist of visionary speculation, it will ever be involved in much obscurity. It is only by means of a series of facts well understood, that we are enabled to arrive at those general truths, which promote the advancement of science, and extend its boundaries. Men in general are not willing to submit to the toil and study necessary to acquire a knowledge of these facts, the investigation of which affords no field for the discursive flights of imagination, but requires the severest exercise of all the faculties of the mind in the work of close and minute observation.

Less exactness of thought and precision of language have been required from the founders of systems and doctrines in medicine than in many other sciences, as its objects are supposed not to admit of accurate calculations or clearly defined views ; and it must be allowed that its progress is impeded, and its cultiva-

tion obstructed by serious difficulties arising out of the intricate nature of some of its enquiries. It seems, however, highly probable that it is susceptible of more definite reasoning, and stronger evidence, than has hitherto been imagined even by the most intelligent inquirer, though it cannot be expected that the physiologist will ever be capable of laying down invariable rules for the treatment of the same disease when it attacks individuals of different constitutions, under circumstances widely dissimilar, since these rules must always be subject to modifications, varying according to the existing differences, which cannot be distinctly stated or described. It must not, however, be too hastily concluded from this admission, that general rules, deduced from unquestionable principles, though liable to many exceptions, will be extremely limited in their operation, and doubtful in their influence; this is so far from being true, that they will decide many points in medicine which are now uncertain, and will confirm and establish whatever in it is correct. As no two constitutions are altogether alike, or ever affected precisely in the same manner by the same disease, the difficulties attending the establishment and application of general principles, are so great and numerous,

that they will continually throw obstacles in the way of exact calculations and precise conclusions, without, however, preventing the formation and employment of general rules.

The nature of some constitutional differences, it will never, perhaps, be possible to ascertain, but we may rest assured that this subject will lose much of its present abstruseness when the laws of the animal economy are better understood, and that a greater degree of certainty, proportionate to our more intimate acquaintance with those laws, will be introduced into the practice of medicine. Differences in the constitution of individuals, whether original or acquired, can be discovered in no other way than by a knowledge of these laws, or, in other words, by becoming acquainted with the functions of the more vital organs, together with the effects which they severally or conjointly produce ; for these effects form in reality the distinguishing features of every individual system.

Physiology, if properly cultivated, will give us clear notions not only of the animal economy in a healthy state, but of the various phenomena succeeding its derangement, the

nature and causes of disease, and the operation of remedial agents. Although the study of this science has yet thrown but a partial or dubious light on these and other matters of equal importance, we are not, therefore, entitled to conclude that it will not, in future, more clearly elucidate them, since it is not difficult to point out the causes which have hitherto limited its utility, and the errors into which preceding physiologists have fallen. The many valuable and incontrovertible truths, discovered by experimental philosophy in the various departments of science, have certainly given the inquiring mind a prejudice in favour of it, as if it were alone calculated to lead to sure and satisfactory conclusions. When the objects, reduced to the test of experiment, are of such a nature as to admit of this mode of investigation, it is well adapted to give to the principles of science greater precision and certainty, and to prevent the mind from wandering in too wide a sphere of indefinite contemplation, by compelling the thoughts to revolve around established data, which exercise upon them an attractive and salutary influence.

In certain departments of science, too great an attention cannot be paid to Experimental

Philosophy, but the eagerness with which it has been employed to discover the secrets of the animal system, and the laws which regulate it, has very often tended to involve in obscurity the very inquiries it was employed to elucidate. In the rudest states of chemistry, experiments may be continually made with advantage, because the substances operated upon may be repeatedly subjected to the same process, without any material modification in the circumstances likely to affect the results, so that every successive experiment will necessarily shew the correctness or fallacy of the inferences drawn from the first. In this way truth is securely established and extended. But, when applied to objects endowed with vitality, possessing principles with which we are entirely unacquainted, and performing numerous operations, the individual, combined and reciprocal influence of which is involved in much doubt and mystery, direct experiments are not likely to render what is intricate simple, or what is problematical certain.

The methods of investigation adapted to the exact sciences do not apply, without considerable modifications, to the inexact. In the

former, direct experiments, whenever they can be employed, are of the greatest advantage, in consequence of the comparative simplicity of the objects submitted to analysis, and the ease and success with which this process is generally performed. In the latter, and particularly in the science of physiology, to which my observations are intended chiefly to apply, direct experiments, in the performance of which certain parts of the system are excised, or injured, are of very questionable utility. The instances are few in which results, thus obtained, are of any value, because we are ignorant of many principles and operations, affected by the experiments, which will necessarily modify the number and character of the phenomena evolved, and thus render it very difficult, if not altogether impossible, correctly to appreciate them.

Physiological experiments are suggested and directed by some definite object, either to ascertain the function of an organ, or the influence which one part of the animal economy exercises upon another. It has not been sufficiently considered, by those who have devoted themselves to the study of this science, that the discovery of truth in it, agreeably to this mode of investi-

gation, is much impeded by our imperfect knowledge of the individual functions of the system, the relations which they hold to each other, and the manner and degree in which the disordered action of one is capable of disturbing the rest. The physiologist, therefore, not being able to trace different effects to their respective causes, or apportion to each its distinct and proper influence, eagerly seizes on any appearance that seems to corroborate his preconceived notions, without considering that the phenomena, to which he appeals in support of his opinions, may be the result of many combined causes, besides the one to which he too hastily referred them. Many of the important laws of the vital powers may be more easily discovered by close and continued observation, than by direct experiments which mutilate the frame. In the former mode of inquiry the mind is much less liable to be perplexed than by an exclusive adherence to the latter.

In the exact sciences the philosopher is compelled, at every step of his progress, to perform experiments in order to discover new truths, or to establish those already known. The same necessity is not equally imperative

on the physiologist. Every disease ought to be regarded by him as an experiment, instituted by nature herself for his improvement. As the morbid deviations of the system from its natural state are numerous, and as every constitution possesses different degrees of susceptibility, these natural experiments, if I may be allowed the expression, exhibit so many modifications of the powers of life, that they cannot fail, if analytically examined, to lead to an accurate understanding of the animal economy.

In different persons, different parts of the body are liable to be disordered by the same disease : at one time the brain, at another the thoracic or abdominal viscera, at another only some particular nerve or organ is affected : the causes of these differences acute observation will ultimately enable the enlightened physiologist to detect, and he will be gradually conducted, by a lengthened series of these causes, thus ascertained, to an extensive knowledge of the more vital functions primarily or secondarily influenced, until the mode in which the powers of organic and animal life operate will be satisfactorily explained : but should such well directed and patient observation not be even-

tually rewarded with complete success, it will almost necessarily unfold certain general laws, and will, consequently, render the physiologist much better qualified to perform experiments, because the knowledge he has thus obtained will enable him to take a more enlarged and correct view of effects produced on the frame by different causes, and of the various relations that exist between them.

The great attention which CUVIER had paid to natural history, and particularly to Osteology, enabled him, it is said, to affirm, with considerable certainty, when a single bone was presented to him, the species of the animal to which it belonged. His knowledge on this subject was conspicuously displayed on many occasions, when it threw much light on the remains of animals that existed in a former world, or at some remote period in this. What a single bone was to CUVIER, a striking symptom, whether occurring in disease, or during an experiment, ought to be to the physiologist.

According to certain fixed principles, previously established by much labour and thought, the bone is easily referred, by the

natural philosopher, to the proper species of animal to which it belonged ; and a particular symptom, when the vital functions are better understood, will immediately lead to the knowledge of its origin, nature, and connexions. To give physiological principles greater certainty, and a higher degree of practical utility, a less exclusive attention must be paid to the experimental department of this science, and the phenomena of the animal system, both when healthy and diseased, must be more minutely investigated in all its varying states. In those cases in which experiments may be deemed advisable, they should be simple, easily accomplished, and unaccompanied by serious mutilations of any kind. It must not, however, be inferred from these remarks, that experiments ought never to be performed by which direct injury is inflicted on any part of the body, as this may sometimes be necessary in order to arrive at important truths : but whenever such a necessity exists, one or two experiments will be as satisfactory as a thousand.

In corroboration of this opinion, I may mention the brilliant discoveries of BELL, respecting the nerves of motion and sensibility, which

were the result of a few experiments, neither difficult nor of a particularly revolting kind. I may, perhaps, also be permitted to allude to my own experiments, performed for the purpose of proving the fallacy of the notions generally entertained respecting the functions of the eighth pair of nerves, half a dozen of which experiments were as decisive as any greater number could possibly have been.

These objections are directed against the prevailing bias of the age to pay too exclusive an attention to Experimental Physiology, as if it were generally supposed that no really valuable truths could possibly be elicited except by such a mode of investigation. If it were indeed so essential to the discovery of them, is it not somewhat extraordinary that the purely experimental physiologist has enriched the Science of Medicine with fewer important facts than the simple observer of the phenomena of the system? The former, in the inferences he draws from his experiments, is too frequently influenced by preconceived notions, and, in consequence of his partial acquaintance with the numerous functions of the body, his observation of the particular or general effects on it, is not likely to

lead to the developement of clear views and correct practical principles : whereas the latter, not confining his attention to a few particular points only, directs it to all the vital powers, and to every modification of them by disease, as well as by the operation of various external and internal causes. The necessity of the physiologist being intimately acquainted with the important laws of the system, in order to select proper experiments, and to appreciate the effects which result from them, will be evident from considering a few of the errors that have been committed for want of such knowledge. Numberless experiments, both in this country and on the continent, have been performed for the purpose of ascertaining the influence of the eighth pair of nerves in the process of digestion. As this function is destroyed, or greatly injured, when these nerves are divided, or a portion of them is excised, rather high in the neck, this extraordinary effect was attributed *to the withdrawal of the nervous fluid from the stomach*. This experiment suggested others, which excited the pleasing but delusive expectation that some of the great secrets of the animal economy would by such means be shortly laid open. It was discovered by WILSON PHILIP

that, when digestion was suspended by the division of the above nerves, Galvanism, transmitted to the lungs and stomach, immediately revived the function, and maintained it in activity as long as it was applied.

The inference drawn from this interesting fact was, that Galvanism and the nervous fluid were analogous, either in their nature or influence. As one was apparently capable of supplying the place of the other, it seemed scarcely possible to arrive at any other conclusion. A knowledge, however, of some of the laws of the system, the result of observation and reflection, suggested to me the origin of the fallacy involved both in the experiments and the reasoning on this subject. I had long been of opinion from certain facts with which I had become acquainted, that digestion is generally either good or bad according to the properties and distribution of the blood. When the circulation is decidedly internal, as shewn by the small and frequent pulse, cold extremities, diminution in the generation of animal heat, and by various other indications, the appetite is almost always fastidious, and the digestive powers weak. The consideration I gave to the sanguiferous system led to the

establishment of the following law, which satisfactorily accounts for the suspension of digestion on the division of the eighth pair of nerves, as well as its partial, or complete restoration on the application of Galvanism :—

“ Animal heat is not directly as the quantity of oxygen inhaled, but inversely as the quantity of blood circulating in the lungs at the time.”

Being thoroughly persuaded that digestion and all other functions, were more or less modified by changes in the conditions of the circulating fluid, it appeared to me natural to refer the particular and general effects succeeding the division of the nerves in question, to alterations occasioned in the sanguiferous system, as it was always strikingly disturbed by the experiment. Having arrived at this conclusion, I next considered in what way its correctness could be satisfactorily proved. It was acknowledged by every one, who had divided the nerves, that the lungs were invariably found, on examination, to be considerably congested, in some instances being as firm in substance as the liver itself, and it was, moreover, explicitly stated by WILSON PHILIP, and others, that, during the application of Galvanism, the breathing, which had been before extremely hurried and laborious, be-

came easy and seemingly natural, or in other words, *the lungs, previously engorged with black blood, were relieved from the obstacles opposed to the proper oxygenation and distribution of the vital fluid.*

In the experiment which I performed, the nerves were divided, as they had been by others; but, in addition to this, the windpipe was cut transversely through, and a small brass tube was introduced into the inferior portion, in order to allow the free ingress and egress of air into and from the lungs, which are prevented by the division of the nerves: when this was done, the animal on which this experiment was tried, breathed with perfect facility, and digestion and all other important functions were performed with their usual regularity. The conclusiveness of this experiment has never been called in question: the full explanation of it, and of many other facts connected with it, will be found in the “Experimental Inquiry.” I have alluded to it here for the purpose of more clearly illustrating the necessity of the experimental physiologist having a general knowledge of the great principles of the animal economy, and a particular acquaintance with

the effects either immediately, or remotely, succeeding his operations, in order to appreciate justly the phenomena evolved by them.

A thorough acquaintance with the law to which I have alluded, is necessary to the successful performance of every experiment by which the whole system is affected, as well as to the clear understanding of almost every disturbed condition of the vital powers, whether arising from disease or any other cause. In proof of the correctness of this opinion, let us advert, by way of illustration, to the experiments of SWAN, performed for the purpose of ascertaining the action of mercury on the body. In most of his experiments, the grand sympathetic nerve was found, on dissection, in a state of inflammation, a circumstance which led him to conclude that this agent disorders the system by first producing disease in this particular nerve: though he acknowledges that the thoracic and abdominal viscera were, in many instances, equally deranged.

Appearances on dissection, as observed in several cases, are described by SWAN, but these clearly show that the effects were rather general than partial; it was, therefore, highly

unphilosophical to limit the operation of mercury to any particular organ. His inferences would have been less hastily, and more legitimately, deduced, had his views of the functions of the sanguiferous system, and of the manner in which they are modified by various causes, been more correct. This observation may be justly applied to the labours and opinions of others, to whatever department of experimental physiology their attention has been directed, and especially to the method which has been generally adopted to ascertain the particular manner in which poisons act on the animal economy. This method is not such as is likely to lead to the discovery of truth. Poisons are given to animals—a few of the most remarkable effects produced by them during life and after death, are noted by the physiologist, who, without being very intimately acquainted with the general laws of the vital powers, the functions of each organ, and the manner in which the disturbed action of one affects all or any of the rest, draws his important conclusions.

Although considerable improvement has of late years been made in some departments of physiology, it is still confined, with few ex-

ceptions, to points of slight practical value : a circumstance which will partly account for the little interest which the Medical Profession has hitherto manifested in the advancement of this science. That it has not been made to bear immediately on practice arises less from its abstruse and complex nature than from the unphilosophical mode in which it has been studied. I shall endeavour to point out those subjects to which the physiologist ought first to attend, and the general remarks I shall make will, perhaps, suggest the proper mode of conducting his inquiries. It is not, however, my intention here to explain at length any of the subjects introduced as illustrative of a philosophical method of inquiry. My object is simply to shew, as briefly as possible, in what way physiology may be studied, so as to confer upon the Science of Medicine much greater benefits than it has yet derived from it. The practical exemplification of my views will be given fully in a subsequent part of this Treatise, and in other Treatises which will follow it.

I. The moving powers of the blood claim the first consideration of the Physiologist.

As this fluid undergoes extensive changes whenever the organs which influence its circulation are disturbed in their actions, and as the various functions of organic and animal life are consequently disordered, it is evident, that a thorough knowledge of the sanguiferous system, and the laws that regulate it, is essentially necessary to the physiologist as well as to the physician, since it is intimately connected with the enquiries of the one and the practice of the other.

The sources of propulsive power are—

- 1st. The heart ;
- 2nd. The capillary system ;
- 3rd. The changes in the capacity of the lungs.

The muscular motions of the body, which are, indeed, extremely numerous, accelerate the flow of blood, but, as they are only occasionally, and not unintermittingly, excited, they cannot justly be enumerated among the permanent causes of its circulation ; their influence, however, should be always carefully kept in mind, as it will often be advisable to excite or suspend them, in the treatment

of diseases. Some eminent physiologists believe that the capillaries, and the changes in the capacity of the lungs, exercise little, if any, direct power on the circulation of the blood. I am, however, disposed to think, that it is possible to bring forward decisive evidence in favour of the agency of the former—evidence which appears entirely to subvert the supposed conclusiveness of experiments adduced to disprove such agency; and the influence of the latter can scarcely be denied, if we impartially weigh the strong facts adduced in its support.

If it can be clearly established, that both causes accelerate the motion of the blood, the physician, in his investigation into causes which produce, extend, and maintain disease, will frequently direct his attention to the capillaries and the respiratory organs, as any irregularity in them may have occasioned, or may have materially influenced the character of the morbid derangement which is the subject of his consideration. A better understanding of the functions of the capillaries will certainly lead to more correct views of the origin, nature, and treatment of diseases. To endeavour to ascertain the functions of

these vessels, the manner in which they are acted upon by various external and internal agents, and the way in which such action affects the powers of life, is an undertaking replete with interest, and, if successfully pursued, will be attended with the greatest benefits.

The French physiologists have, of late years, paid a particular attention to this subject, and it is only just to acknowledge, that they have thrown much light on the nature of some diseases; and as their attention is still ardently and unremittingly directed to the same subject, we may fairly anticipate that it will eventually lead to a further and more extensive improvement of pathology, which will ultimately be of great service to the Science of Medicine.

It will scarcely be questioned that the blood is propelled chiefly by the heart, since every invigorated action in it is the cause of the better oxygenation of the vital fluid, a process which, in its turn, gives greater force and frequency to the contractions of this organ; whilst an opposite condition of the heart is accompanied with contrary effects. The action of the heart may be influenced either directly or indirectly;—*directly* by whatever is conveyed to the heart, whether

of a stimulating or sedative kind, in the course of the circulation, or through the nerves and vessels connected with it, in which manner Galvanism and electricity may be supposed to operate in part, when applied in the immediate vicinity of the heart ;—*indirectly* by whatever affects the properties or distribution of the blood.

The investigation of the different agents which influence the heart, in one of these two ways, would occupy much more space and time than I can here bestow upon it. To do justice to the subject, it would be necessary to enter into a particular consideration of the mode in which poisons affect the system, as some of them are supposed to act upon the heart, and it would not be difficult to prove, that others which are thought to influence the brain alone, occasion death, or produce their usual effects, in consequence of the heart being primarily and exclusively disordered by them.

The first step in the investigation, is to ascertain the functions of the heart and brain, in what way they are capable, directly and indirectly, of disturbing the system, and the

next, the precise relations existing between these two important organs. WILSON PHILIP, from numerous experiments which he performed, came to the conclusion, that the heart is independent of the brain, but may be influenced through it.

It was shewn in the “Experimental Inquiry,” that his ideas on this subject are far from being correct—and that the heart, instead of being affected through the brain, by the nervous, is acted upon by the sanguiferous connexion existing between these two organs. We should endeavour to determine the operation of internal agents, as a knowledge of this kind is indispensably requisite to suggest the employment of proper remedies. Many, whose mode of action is altogether unknown, prescribed from certain general or obvious effects which they produce in the condition of the animal economy, act primarily, and almost entirely, on the heart and capillaries; the benefit arising from the employment of these agents must, therefore, be attributed solely to the invigorated circulation of the blood, and its better oxygenation, which are necessarily produced by an increased action in these two processes.

If the benefit can be clearly traced to those *causes*, it is evident that the knowledge of this fact will influence, to a considerable extent, the selection and application of remedial measures, since it will naturally lead the intelligent mind to reflect in what way the desired object can be accomplished with the most ease, and with the least possible danger to the patient. The contractions of the heart are influenced, as previously stated, by whatever affects the distribution of the blood, and this is modified by the disturbed action of the respiratory organs, whether arising from coughing, vomiting, nausea, sighing, laughing, or speaking; also by the application of external and internal stimulants and sedatives, (the latter not acting directly on the heart) injuries inflicted on the cerebrum, obstacles to the circulation, bleeding, purgatives, the removal of pressure from the abdominal and thoracic viscera, and other causes which it is not necessary here to particularise.

It is, then, obvious, that the mature consideration of the manner in which the heart is directly and indirectly influenced by different agents, and the nature of the effects which they produce in the sanguiferous system, is

calculated to give to medicine so much greater a degree of certainty than it at present possesses, as almost to render it an exact science. Little dependance can be placed on any inferences drawn from observation and experience in medicine, unless they are made under the more enlightened direction of physiological knowledge: because, in cases of great difficulty or emergency, the symptoms of diseases are themselves of too doubtful a nature to suggest proper and efficient measures. Experience and observation do not, indeed, bestow on the understanding an enlarged and distinct apprehension of things, nor endow it with the faculty of tracing cause and effect through a lengthened series of changes; being chiefly occupied in the consideration of insulated facts, not of facts closely associated together by general principles, elucidating the close relation they bear to each other, and the combined evidence they afford in proof of valuable, or important truths.

II. The causes which influence the properties and distribution of the blood have the next claim to the attention of the physiologist.

It has been stated, in the preceding pages, that whatever modifies the contractions of the heart affects the properties and distribution of the vital fluid. This opinion is founded on the principle, that every such modification either accelerates or retards the circulation of the blood through the lungs, and, consequently, tends to produce, as shewn in the "Experimental Inquiry," its more or less complete oxygenation. It is, therefore, necessary that the physiologist should endeavour to ascertain precisely the several causes which influence the action of the heart, since diseases are generated, extended, and cured, by changes in the sanguiferous system. If it is deranged by cold, fear, or any other circumstance that greatly retards, or accelerates, its circulation, local or general disorders are liable to be produced. The remedies, employed in the treatment of these disorders, are generally beneficial in proportion to the influence they exert in regulating the distribution of the circulating fluid.

III. The physiologist ought further to consider in what way changes in the properties and distribution of blood produce a general, or local effect on the system.

The consideration of this subject naturally succeeds the two preceding, and an accurate knowledge of it would place the science of pathology upon a broad and secure foundation. It would then be easy to reason from causes to effects, and from effects to causes, and various practical advantages would be immediately derived from the correct views such conclusive reasoning could not fail to establish. From the intimate connexion that exists between the well-established principles of physiology and pathology, it is evident that these sciences mutually reflect light on each other, and that a knowledge of both is necessary to corroborate and confirm what is true in either of them. The physiologist develops his principles in detail, and this he is enabled to do, with great precision and accuracy, from his acquaintance with numerous facts derived from pathology, which, as I have previously remarked, may be regarded as natural experiments, an attentive examination of them necessarily leading to a knowledge of the functions of animal and organic life. In almost every step of his progress he appeals to these facts, and forms upon them his opinions, especially where the facts are of such a nature as to exercise a practical influ-

ence on medicine. The pathologist who, in the investigation of disease, conducts his enquiries in the just spirit of philosophizing, first makes himself acquainted with the functions of those organs, or parts of the body, the disorders of which he intends to examine, and, in order more surely to arrive at truth, forms an intimate acquaintance with the natural powers of the animal economy. But how rarely have these indispensably preparatory steps been taken by those who have studied the nature of diseases ! Led to the investigation of them by the accidental success which has followed a certain plan of empirical treatment, or by traces of disorganization observed, on dissection, in some particular organ, their object has seldom been to ascertain the principal laws of the system in order to gain correct views of the origin and character of local, or general affections. It would be easy to illustrate the truth of these observations by referring to a thousand beautiful but visionary pathological doctrines, which have originated in an imperfect knowledge of the great laws of the animal frame.

The manner in which changes in the

properties and distribution of the blood produce a general or local effect on the system, cannot be ascertained until two important subjects have been maturely considered :—

1st. What are the functions of the more vital organs ?

2d. How the disturbed action of one organ affects all, or any of the rest ?

It is impossible to explain in what way modifications in the sanguiferous system influence the powers of organic and animal life, until something like exact knowledge has been obtained on these preparatory subjects of enquiry. This, however, is not the place for entering upon the consideration of them. It is sufficient for my present purpose to mark out the proper path of inquiry, to shew what subjects are most worthy of being studied, and to facilitate, by these directions, the establishment of more enlarged and correct views of the animal economy, as well as of the origin, nature, and treatment of diseases.

IV. Another important subject of inquiry, to which the physiologist must attend, is the

manner in which the organs are associated together in harmonious action by means of the nervous and sanguiferous systems.

This enquiry is intimately connected with the last of the two mentioned above. It deserves, however, a separate consideration, as it leads to highly interesting and important investigations, which are not necessarily connected with the enquiry alluded to. Our knowledge of sympathetic phenomena, whether appearing in ordinary cases of disease, or in the foetus, under circumstances of a peculiar nature, will be more or less exact in proportion to our acquaintance with the extensive influence of the sanguiferous system. I have endeavoured to shew in the “*Experimental Inquiry*,” as well as in the “*Physiology of the Foetus, Liver, and Spleen*,” that numerous sympathetic affections which have been attempted to be explained by the supposed action of the nerves, are much more simply and satisfactorily accounted for by that of the sanguiferous system. There is certainly a great difference between these two views of the subject: as, however, my opinions are founded on principles that have not yet been shewn to be incorrect, explanatory of the gene-

ration of animal heat, the striking changes in the properties and distribution of the blood, and the manner in which these changes generally affect the powers of life, it is scarcely possible to doubt the accuracy of those opinions, or to call in question the justness of their application.

V. The physiologist ought finally to pay a particular attention to the functions of the nervous system.

The imperfect knowledge we possess of the functions of the nervous system, has afforded a wide latitude to fanciful notions and ingenious speculations. Physiologists have made the same use of this system as metaphysicians, before the time of REID, of the "Theory of Ideas," who appealed to it on all occasions, as satisfactorily explaining all mental phenomena, without once considering that the premises from which they derived the most important doctrines, were altogether imaginary : hence, with all the gravity of assumed wisdom, they regarded their baseless hypotheses as well founded systems, and their speculative reasoning as inductive calculations. Great merit is generally supposed to be due to REID, for de-

monstrating that the first principles of the ideal theory, though generally adopted as unquestionable, had no foundation whatever in nature. Equal merit would certainly belong to the physiologist who, in the same way, should succeed in pointing out the extent of our ignorance of the functions of the nervous system. Sufficient credit is rarely given to those who fearlessly expose errors. He who clears the way for the future progress of truth, greatly facilitates its advancement. It has lately been ascertained, from physiological observations, that there are two grand classes of nerves employed in the exercise of the powers of organic and animal life, nerves of motion, and nerves of sensibility, but the mode of their action is yet entirely unknown. We are ignorant of the manner in which they contribute to digestion, secretion, assimilation, absorption, and we cannot determine whether they exert any direct influence on these functions. The probability is that they do not. Sensibility and motion are properties which are distributed, in various proportions, to every organ, and it is not unreasonable to infer, from the important changes which are produced in these several functions by modifications in the sanguiferous system, that nervous

power is only indirectly necessary to their action. The stomach, for example, is manifestly endowed with both sensibility and motion, and it can scarcely be doubted, that these properties are produced by the nervous system, but we have no evidence to prove that capillary circulation, the secretion of gastric juice, and the evolution of heat, arise from the same cause. It would be waste of time to allude here to the many visionary opinions which have long been entertained by physiologists on the supposed action of the nerves. They are scarcely worthy of a serious consideration : a knowledge of the influence exercised on the vital powers by changes in the properties and distribution of the blood, renders it highly probable, that the nervous system is a much less extensive agent in the animal economy than has hitherto been imagined.

If clear views of this very important subject could be obtained, the Science of Medicine would derive great advantages from them, as they would free it from many crude and absurd notions with which it is at present encumbered. It ought, therefore, to be the endeavour of enlightened physiologists to

ascertain the extent of our knowledge of the nervous system, and should that knowledge be found, on examination, very contracted and imperfect, the interests of science, and the welfare of mankind, would be promoted by a candid acknowledgment of the fact. The influence of the nervous system may be much less than has been generally supposed, and other powers, which have no connexion with it whatever, may, in reality, be the true causes of effects which have always been attributed to its operations.

In the foregoing pages, I have attempted to point out a few of the leading subjects, which ought to engage the consideration of the scientific enquirer, who is anxious to advance the progress of physiology, or to place that of medicine on broader and surer principles. I am fully sensible how imperfectly I have executed the task : my labour, however, will not be in vain, if it produce the conviction that these subjects are of a most important kind, and that an intimate acquaintance with them would lead to the establishment of the most valuable physiological truths. The matters to which I have alluded, have the closest possible connexion with the natural,

or deranged, conditions of the animal economy. The consideration of them throws light on two great classes of disease, the inflammatory, and the congestive, each of which includes numerous disorders. The properties and distribution of the blood, in the former class of diseases, are very different from what they are in the latter, and the measures, which ought to be adopted for the relief of the one are, therefore, very different from those which would be required by the other. A successful investigation of the inquiries, which I have recommended to the attentive consideration of the physiologist, would explain the origin and nature of these differences, and thus render the principles of medicine more fixed and certain than they are at present; the knowledge acquired by such an investigation, would be found very serviceable in the treatment of every species of disease, because, in almost every violent disorder, the vital powers are modified, either primarily, or secondarily, in the way which has been partially described in this chapter, and consequently the highest practical advantages would result from such a knowledge.

SECT. III.

How far, and in what way, the Study of Pathology facilitates the establishment of sound principles and correct reasoning in the Science of Medicine.

THE consideration of this subject seems naturally to follow that discussed in the preceding section, for, whilst engaged in pointing out the more important of the vital functions, as well as the manner in which it is necessary to investigate them, in order to acquire correct and enlarged views of the animal economy, the preparatory steps were taken to the further prosecution and proper understanding of this inquiry. Our attention in the foregoing pages has chiefly been directed to the operation of causes, continually alluding, however, to the most striking effects produced by them, in order more clearly to elucidate the physiological principles advocated in this work. The present inquiry may be termed the examination of effects; it is, however, impossible to

pursue it without a constant reference to their respective causes, which will probably lead to the frequent repetition of similar remarks. From the very intimate connexion which, in this Treatise, is shewn to exist between physiological and pathological principles, it is clear, that one cannot be investigated without continually adverting to the other. The two sciences have commonly been studied too independently of each other, and this mode of studying them, has been injurious to the progress of both ; for the light which they mutually reflect on each other, if viewed in conjunction, would accelerate the discovery and application of the numerous truths which they are capable of unfolding. One of the most striking errors of pathological works, is the almost exclusive attention which is paid in them to the examination of organs, primarily and chiefly diseased, to the utter neglect of the consideration of the various effects they produce, which frequently convert a local into a general affection ; a circumstance of so important a kind as to demand the strictest attention of the practitioner, since it must, when known, materially alter his line of treatment. The study of physiology, however, when it is conducted in a more enlightened

and philosophical manner, will ultimately enable the pathologist to trace, with greater accuracy, cause, and effect, through an extensive series of changes. An intimate acquaintance with the nature of diseases generally leads to definite ideas of their co-existing or consecutive effects, which are not, as they may appear to superficial observation, confined to one or two organs, but, as is evident on a juster view of them, which extend to the whole system. The knowledge, for instance, of the pathology of Pneumonia is not restricted to an acquaintance with the three stages of this disorder, as minutely described by LÆNNEC, but embraces all the phenomena attending it, such as a strong and accelerated pulse, an increase in the generation of animal heat, violent fever, a diseased action of the numerous powers of life, and various other conditions.

In the investigation of pneumonia, (and this observation is applicable to other diseases,) there are three things which demand a very patient inquiry.

1st. The causes which produce it, and the manner in which they act.

2nd. The symptoms of the disease, local as well as general.

3rd. The proper mode of treatment suggested by an examination of the two preceding subjects.

If the causes of the disease be clearly ascertained, there will be but little difficulty in determining the nature of the symptoms that accompany it, and the likeliest means to remove them. The causes of pneumonia may be divided into external and internal. These two great classes of causes might again be advantageously divided into the exciting and depressing, for inflammation of the lungs may be the effect of an undue predominance of either. It is, however, probable that the former are seldom the direct means of producing inflammation. They may be properly regarded as predisposing to it. The influence of external heat, violent emotions, muscular exercise, the blowing of wind instruments, and the inhalation of stimulating vapours, have occasionally been found to give rise to pneumonia, in consequence of the modifications produced by them in the functions of the pulmonary capillaries; a proper understanding of the manner in which these several

causes operate, will, probably, lead to the conclusion, that the influence exercised by them in the production of the disease, is not so much direct as indirect. *They occasion a general excitement of the system, which renders it particularly susceptible of the agency of causes, calculated to depress the powers of life.*

The inhalation of stimulating vapours is certainly more likely than any of the other agents, to produce by its direct influence pneumonia, particularly if the vapours are exceedingly irritating in their nature, but if otherwise, the morbid effects succeeding their operation, must be mainly attributed to a general and not to a local influence.

It will be shown in a subsequent part of this Treatise, that internal stimulants, either in a gaseous or liquid form, excite every part of the system by accelerating the contractions of the capillaries and the heart, with which organs they are in actual contact, in consequence of which the more complete oxygenation of blood is promoted. Whether the internal and external causes be regarded as acting directly or indirectly in the production of pneumonia, one fact is indisputable, which is

of great practical importance :—viz. *that the disease is the consequence of modifications in the sanguiferous system, with the nature and origin of which it is not difficult to become generally acquainted.* When we are able clearly to ascertain the cause of any effect on the animal economy, our knowledge of that cause will almost necessarily suggest measures calculated to exercise a beneficial influence in the treatment of the disorders induced by it, because the various steps by which we gradually descend from the former to the latter, however extensive the series of them, render it easy to perform the reverse operation, which cannot be accomplished without immediately leading to the establishment of correct practical principles.

I do not intend to enter here into a detailed explanation of the nature of the morbid condition of the lungs, occasioned by any of the causes which have been previously enumerated, it is sufficient to know that every stage of the disease is characterised by congestion. To study the subject minutely, would necessarily lead to the consideration of the numerous phenomena of inflammation, as well as the various theories which have been formed to

account for it, the knowledge of which is not essential to appreciate the justness of the general principles laid down in this Treatise. It may, however, be well to observe, that the doctrine of BROUSSAIS and other pathologists, which states, that nervous irritation invariably precedes an inflammatory or congestive condition of the capillaries, is extremely questionable;* in many cases, indeed, it is obviously incorrect, and it does not in any instance appear to admit of decisive proof.

A consideration of the different causes producing inflammation of the lungs, will satisfactorily show that they disturb the natural

* Ainsi que l'ont fait remarquer MM. Broussais et Lobstein, l'irritation nerveuse précède toujours la fluxion que la stimulation d'une partie détermine ; c'est-à-dire qu'avant que les vaisseaux capillaires soient émus, et que la congestion s'opère, les capillaires nerveux sont déjà irrités : l'irritation s'étend ensuite aux vaisseaux, et ce n'est qu'alors que le mouvement fluxionnaire s'effectue. Nous avons dit précédemment que l'irritation peut rester concentrée pendant assez long-temps dans les nerfs sans que les phénomènes de l'inflammation se développent ; mais si l'irritation nerveuse est vive, les sympathies peuvent déjà être mises en jeu, et nous avons déjà fait observer qu'elles pouvaient susciter dans les viscères des troubles assez graves pour entraîner la mort du malade avant que la phlogose soit établie dans la partie irritée.—*Exposition des Principes de la Nouvelle Doctrine Médicale, par J. M. A. Goupil. P. 107.*

functions of the sanguiferous system, in consequence of which disturbance, an undue quantity of blood is determined to these organs. It will also tend to explain the frequent complications of this disease—the origin of the purely inflammatory or typhoid symptoms, and many other phenomena which have hitherto been regarded as inexplicable or accounted for on some fanciful nervous theory.

Pneumonia is at one time a primary affection, unconnected with any other disease, at another it is secondary, co-existing with various other derangements, occurring in the advanced stage of certain fevers, or, on the sudden retrocession of several eruptive diseases, as the small-pox and the measles, and occasionally, indeed, succeeding other affections. In order to illustrate the manner in which the sanguiferous system is liable to be influenced by changes in the conditions of a disease, or, in other words, by its various stages ; it may be as well to explain how inflammation of the lungs happens to be so frequently excited by such circumstances, showing, first, in what way an eruptive disease affects the circulation generally ; and next, the causes of its sudden retrocession. I have dwelt, in the

“Experimental Inquiry,” at considerable length, on two conditions of the circulatory system, designated *internal* and *external*, and the reasoning and facts advanced in that work, will tend to remove the difficulties in which the subject we propose to consider seems to be involved.

Every eruptive disease excites and maintains an inflammatory action on the surface of the body, the tendency of which is to withdraw a considerable quantity of blood from the internal organs, producing a condition of the circulation which may be justly termed *external*. The eruptive process could not possibly be carried on with vigorous energy, unless this modification occurred in the distribution of the blood, and hence it follows, that whatever enfeebles the action of the superficial capillaries, tends prematurely to arrest every such process.

Inflammation of the lungs has often been occasioned by the external application of cold, a circumstance by no means extraordinary, if we consider that the blood on the surface of the body, must, by such an application, be necessarily determined to the internal organs. The

lungs receive a portion of this undue determination of blood, the extent of which is regulated by causes, the exact influence of which, it is extremely difficult to appreciate. Disease of the bowels often co-exists with pneumonia when thus produced, and may justly be referred to the internal circulation, which excites inflammation in one part of the system or another, according to the degree of susceptibility possessed by each.

Although an eruptive disease is sometimes suddenly repressed by the influence of external cold, it is, nevertheless, probable, *that this effect is generally attributable to internal causes*, which disturb the functions of the sanguiferous apparatus. The circulation on the surface of the body is as much under the controul of causes operating within as from without the system. An invigorated action of the heart stimulates the functions of the capillaries generally, and may, consequently, promote the eruptive process; if, however, its contractions are feeble, and the blood which it distributes but imperfectly oxygenated, (circumstances of frequent occurrence, arising from changes in the healthy condition of the vital powers,) the capillaries on the surface of

the body are as manifestly influenced by these internal causes, as by the external application of cold, and the same general effects necessarily ensue.

This explanation of the modifications of the circulatory system in small pox, or any other eruptive disease, shows the importance of a knowledge of this system, both in a theoretical and practical point of view, since it not only elucidates the nature of many diseases, previously involved in much obscurity, but, also suggests remedial measures calculated to remove or ameliorate them.

An acquaintance with the causes that produce chronic, is of much greater importance than with those which occasion acute inflammation of the lungs, as the origin, nature, and proper treatment of the former disease are subjects much less known than those of the latter. In the acute form of the affection, the symptoms of inflammation are so evident that it is scarcely possible not to discover them, and the treatment suggested is so generally correct in its outline, as not to require, in this place, any very lengthened remarks. It is, however, probable, that the first and last

stages of the acute disease, characterised rather by congestion than a purely inflammatory action, might be treated much more efficaciously than they have hitherto been. A more philosophical line of practice would often arrest the disease in its first stage, or render it comparatively mild, and disorganization of the lungs and other viscera, would be less frequently observed to accompany the last,—at least, in an aggravated form.

II. Having made these observations on the causes, let us now consider the origin and nature of the local and general symptoms of pneumonia.

If we know how causes act in the production of a disease, little difficulty can be experienced in endeavouring to ascertain the origin and nature of its symptoms, as they are necessarily explained by the operation of the causes with which we are already acquainted. According to the extent and accuracy of our knowledge of the causes of disease, and our consequent acquaintance with its symptoms, the means we employ will be energetic and beneficial, or inefficient and injurious. In the acute form of pneumonia, the blood drawn

from a vein is exceedingly buffy :—and from any variation in this appearance, we may judge, with considerable accuracy, of the particular state of the disease, the modifications of the circulatory system being a sure index of its increase or diminution. It may hence be inferred, that there is an intimate connexion between this morbid condition of the circulating fluid and the severity of the disorder, which has never yet been explained. Bleeding has generally been more or less used in the treatment of acute pneumonia, according to the degree of the inflammatory state of the blood. It is, however, melancholy to reflect on the injurious effects which a too confined attention to this symptom has produced—a symptom occasionally observed in cases in which there is no proof of inflammation, the appearance mistaken for it arising from muscular exercise or mental excitement.

It is, therefore, obvious that a knowledge of those laws of the animal economy, on which the changes in the sanguiferous system depend, is of the highest practical importance, as it will point out under what circumstances, and to what extent, bleeding may be advan-

tageously prescribed in different inflammatory affections, and will, moreover, suggest and regulate the employment of other remedies. It will, then, be admitted, that a knowledge of the causes productive of such modifications in the blood is essentially necessary to the explanation of numerous co-existing phenomena and the establishment of sound practical principles. The fever which accompanies pneumonia is, at one time, purely inflammatory, at another, typhoid : *now, all the diversities which it exhibits are attributable to circumstances which promote the greater or less oxygenation of the blood.* The truth of this assertion has been proved in the “Experimental Inquiry,” and in the present Treatise it will be illustrated and confirmed by a more minute investigation of the subject. An attention to the temperature of the body, the conditions of the skin, and the state of the pulse in cases of inflammation, is of little practical importance, unless the causes of them be accurately known. If viewed as separate and independent phenomena, they cannot possibly lead to the formation of enlarged practical principles, because, in this case, their respective causes would not in the least degree be duly appreciated.

The symptoms, occurring in pneumonia, have hitherto been very imperfectly understood. They have never been studied in connexion with their true causes, and hence, in many instances, they have not only failed to suggest proper and efficient measures, but have often led to the adoption of a line of practice decidedly injurious.

III. As the object of these remarks is to suggest a general method of arriving at a correct knowledge of the nature of an inflammatory affection, by pointing out the several symptoms, or conditions of the system, requiring a minute investigation, and the mode of pursuing that investigation, the proper mode of treatment next claims our consideration.

A slight attention to this subject will clearly shew, that even those, who have almost exclusively studied diseases of the lungs, entertained partial and erroneous views of the action of the remedies they employed. It is scarcely possible to know, as I have before observed, the exact way in which causes operate in the production of disease, or the effects directly or indirectly flowing from

them, without, at the same time, being able to select means calculated to prevent, remove, or ameliorate them. LÆNNEC, in speaking of the operation of Tartar Emetic, observes, “in my opinion it is enough for the practical physician to be able to appreciate the effects of a remedy, and to determine experimentally the cases in which it is useful. At the same time, if in the present instance it is thought of use to ascertain the mode of action of the remedy, I should say that its most constant effect is the rapid resolution of inflammation, and sometimes the speedy absorption of the inflammatory effusion.”*

If the knowledge of the physician be thus limited, his practice will be rather empirical than scientific, exercising an influence partially, instead of generally, beneficial. It is evident from the passage just quoted, that LÆNNEC had in view the ultimate effects, and not the extensive series of the intermediate, or in other words, the exact manner in which the vital powers are affected by the remedy to which he alludes. In order to know the intermediate effects, it is necessary

* LÆNNEC on Diseases of the Chest. Trans. by JOHN FORBES, M.D.—Page 262.

to be thoroughly acquainted with the operation of the agents employed, to appreciate all the changes produced by them in the system, or, at least, the more important of those changes, and further, to be able to determine the circumstances calculated to render their action beneficial or injurious. One great reason why fixed and enlarged practical principles have not been established to a greater extent than they are at present in the Science of Medicine, is, that the attention of physiologists has been given to the ultimate, to the almost entire neglect of the intermediate, effects. To treat diseases with the greatest possible advantage the practitioner must be conversant not only with the nature of the existing derangements, but likewise with the *modus operandi* of different remedies, so that he may be able to produce with certainty and safety the particular changes required. To be acquainted with the facts that inflammation exists, and that Emetic Tartar frequently facilitates its resolution, is knowledge much too limited to suggest efficient means, because the circumstances accompanying inflammation are not always the same, but often so extremely various as to demand proportionate

modifications in the line of practice—modifications which cannot possibly be suggested by a knowledge only of the ultimate effects.

Bleeding is known to accelerate the resolution of inflammation, but is not its action on the system very unlike that of Emetic Tartar? Could they be prescribed indiscriminately, in the same disease, with equal benefit? If not, the inquiry immediately presents itself, what are the circumstances which ought to determine the selection? Evidently a knowledge of the laws of the animal economy, of the way in which they are liable to be disturbed by disease, and of the operation of the most important remedies.

It will, I think, be admitted by the warmest admirers of LÆNNEC (and amongst this number, having formerly been one of his pupils, I feel a pride in ranking myself,) that his merit, as a physician, which was confessedly great, chiefly consisted in detecting morbid changes in the thoracic organs during life, and in giving a minute description of them after death. His acquaintance with these subjects led to the development of no great prac-

tical principles. Until the practitioner has a thorough knowledge of the vital powers, until he is intimately acquainted with the reciprocal influence which they exert on each other, and the manner in which they are primarily disturbed by external and internal causes, the treatment he adopts will necessarily be regulated rather by his knowledge of ultimate than intermediate effects; and hence we may clearly perceive the utter fallacy of LÆNNEC'S opinion, that an acquaintance with the former alone is necessary to the practical physician.

The blue pill of ABERNETHY, the purgatives of HAMILTON, and even the cold and warm immersion of CURRIE, were prescribed rather from the knowledge possessed of the final effects produced by them, than of the mode of their influence on the more important functions of the system: and they have failed for want of this latter knowledge to introduce practical principles capable of enlarged and efficient application.

In the treatment of pneumonia, the first consideration is, the stage of the disease, or, in other words, the manner in which the vital powers are affected by it. When this point

is determined, it becomes then a matter of inquiry, how the two great classes of remedies—the external and internal—operate, and which of those included in these classes are best calculated to answer the objects in view?

It is scarcely necessary to remark, that a judicious selection and application of them demands considerable practical and theoretical knowledge, indeed, much more than is possessed, at present, by the most enlightened in the medical profession.

In every stage of the disease, the principal object of the practitioner should be *to equalize the distribution of the blood and re-establish its healthy condition, which may be accomplished in various ways.* Bleeding, Tartar Emetic, and Diaphoretics may be employed in the first stage with decided advantage; but if prescribed in the second, the employment of them must be considerably modified, in order to be properly adapted to the morbid differences then existing. It may, perhaps, be advisable, in the still later stages of the disease, to enforce the active application of some of these remedies, and altogether to discontinue that of others; but it is, however, clear, that the de-

gree of discrimination implied in the selection of one and the rejection of another, can be conferred only by an accurate acquaintance with the vital powers—the mode in which they are influenced by local and general diseases, and the operation of the more important medicinal agents.

The proper mode of studying pathology may be still further illustrated, by considering the diseases of the mucous membrane, pointing out the relations which that membrane bears to certain organs in particular, or the human frame generally, and showing how it is liable to be affected by different external and internal causes. In one situation, the office of this membrane is chiefly to secrete a powerful solvent; in another, a bland fluid, which protects the highly sensible surface from irritating substances; in a third, to create a moist atmosphere, which is unceasingly produced and evolved in the form of exhalations, which maintain in regular and healthy action many of the delicate operations of the system.

It is not necessary to describe the numerous phenomena resulting from a difference in the structure of the mucous membrane; it will

be sufficient to point out such only as originate in certain relations to the sanguiferous system, possessed in common by every part of it, the knowledge of which is of the highest practical importance.

The heart propels the vital fluid to every part of the body, but the energy with which it is circulated in the different organs varies as they are more or less remote from the source of motion. This simple and incontrovertible fact will satisfactorily account for the origin of particular diseases in various situations, at the different periods of life, whether the effect of obvious circumstances acting from without, or of natural changes occurring within, the system. Though the whole of the mucous membrane is supplied with blood of the same quality, yet the farther it is removed from the heart, the more easily is its circulation influenced by depressing causes, giving rise to congestion or inflammation rather of a chronic than acute form. On the contrary, the nearer any part of the mucous membrane is to the heart, the less liable is its circulation to be greatly disturbed by the same causes ; and when disordered, its diseases partake rather of an acute than chronic character.

It is, also, worthy of observation, that chronic diseases of the mucous membrane in the immediate vicinity of the heart, are often the consequences of an acute affection, whereas chronic diseases remotely situated from this organ, are frequently chronic from the commencement. The justness of these remarks might be illustrated by a reference to the several diseases usually found to attack the mucous membrane of the thoracic and abdominal organs. Those of the former at an early age, and, in vigorous constitutions at every period of life, are mostly acute. Those of the latter are more generally chronic. It may, perhaps, be supposed that these differences are attributable to the peculiar functions performed by the mucous membrane, and not to those differences in the conditions of the several parts of the sanguiferous system to which my observations almost altogether apply. That the functions of this membrane are very dissimilar in their nature, is evident: it will, however, appear, on mature consideration, that the different degrees of vital action which they possess (without making any reference here to the ends which are accomplished by that action) *depend on the more or less vascular state of the organs to which*

they belong ; or, in other words, on the quantity and quality of the blood distributed to them. A vigorous condition of the sanguiferous system is found to exist to the greatest extent in divisions of the mucous membrane the nearest the heart, and to the smallest extent in those the most remote from it, facts which strongly corroborate the arguments previously used. The different divisions of the mucous membrane are liable to be affected by a circumstance which has not yet been stated, the influence of which, however, ought to be clearly understood and fully appreciated, in order to perceive the justness of the reasoning I have employed. It may, perhaps, be affirmed as an objection to the correctness of my remarks, that the mucous membrane of the trachea is frequently the seat of chronic disease ; this, however, though an undoubted fact, does not invalidate the principles which I have laid down.

Several divisions of the mucous membrane are extremely liable to be disordered from their immediate vicinity to certain organs. The liver and the spleen are very often congested long before any general changes of structure occur in the animal frame, or in these particular organs, but this derangement tends to produce

such changes in the alimentary canal, in consequence of the circulation throughout the chylipoietic viscera being disturbed, or its existing disorder aggravated by the derangement of the aforesaid organs. *Congestion of the liver and spleen will undoubtedly exercise considerable influence on the circulatory functions of contiguous organs, and it is equally probable, that a morbid condition of the lungs will exert a similar influence on the mucous membrane of the respiratory apparatus.* These are circumstances which must be duly considered, in conjunction with the observations already made, respecting the modifications in the nature and seat of diseases of the mucous membrane, caused by its situation being immediately contiguous to, or widely remote from the heart, as they undoubtedly exercise an extensive influence on the powers of the sanguiferous system. The farther the circulation is from the heart, the greater is the facility with which its motion is impeded by depressing causes acting within or from without the body, because the propulsive power of the heart operating from behind, is not sufficiently strong to overcome the influence of impediments to the free distribution of the blood. The knowledge of this simple fact will go far towards explaining

numerous phenomena hitherto not at all understood, and will thus be found of great practical utility.

A morbid condition of the whole of the mucous membrane, or only of certain parts, has so frequently been observed to succeed mental emotions, that it has been inferred by the most distinguished physicians, that the brain exercises a direct influence on the digestive functions. In corroboration of this opinion, it is stated, that diarrhœa, indigestion, tormina of the bowels, nausea and vomiting are often produced by fear, but these effects are attributable to what has been called in the “Experimental Inquiry,” sanguineous sympathy existing between the organs disordered, and the circulatory system, and not to nervous influence directly communicated to them by the brain.

The difference between these views is very important: the former only pointing out a cause, and the phenomena succeeding its operation without elucidating the exact nature of the connexion between them, and leaving altogether unexplained the numerous intermediate changes which occur between the

first symptom of the one, and the aggravated form of the other : whilst the latter states, in distinct terms, the manner in which the mind disturbs the vital powers, and satisfactorily accounts for the various changes induced, from the slightest functional derangement to the most evident structural modifications. The one, displaying no acquaintance with the nature of the existing derangements, develops no practical principles of an enlarged and efficient character ; the other, on the contrary, at once suggests measures of high practical value founded directly on such principles. The following extract from BICHAT, shows he had no just idea of the nature of the diseases to which he alludes, or the action of their several causes, though it will not be doubted that his physiological attainments were of the first order.*

* La contractilité animale ne saurait être mise en jeu sympathiquement dans le système muqueux, puisqu'elle n'y existe pas.

Il en est de même de la contractilité organique sensible. Il est possible que quelquefois l'espèce de mouvement que nous avons indiquée, et qui se rapprochent de cette propriété, soit excité sympathiquement : je n'en connais aucun exemple.

La contractilité organique insensible est ici très-fréquemment en activité sympathique. C'est surtout la peau qui exerce, sous le rapport de cette propriété, une grande influence sur le système muqueux. 1°. Dans les hémorragies de la surface muqueuse de la matrice, des

A proper understanding of the relations existing between the mucous membrane and the surface of the body, will easily account for the phenomena to which allusion is made by BICHAT, and at the same time explain the cause of the various fallacies pervading the views of BROUSSAIS on the same subject, in treating, which, however, he shows more extensive knowledge than any preceding or contemporary writer. The mucous membrane is liable to be affected by whatever excites or depresses the capillaries on the surface of the

narines, etc., un corps froid appliqué dans le voisinage sur la peau, crispe cette surface et arrête le sang. 2°. Qui ne sait que la production de la plupart des catarrhes est le résultat souvent subit de l'action du froid sur l'organe cutané ? 3°. Dans diverses affections des membranes muqueuses, les bains qui relâchent et épanouissent la peau, produisent souvent d'heureux effets. 4°. Lorsque la température de l'atmosphère engourdit la tonicité cutanée, celle du système muqueux recoit un accroissement d'énergie remarquable. Voilà pourquoi en hiver et dans les climats froids, où les fonctions de la peau sont singulièrement bornées, toutes celles de ce système s'accroissent en proportion. De là une exhalation pulmonaire plus marquée, des sécrétions internes plus abondantes, une digestion plus active, plus prompte à s'opérer, et par conséquent l'appétit plus facile à être excité. 5°. Lorsqu'au contraire la chaleur du climat et de la saison vient à relâcher et à épanouir la surface cutanée, on dirait que la surface muqueuse se resserre en proportion : en été, dans le Midi, etc., il y a diminution des sécrétions, de celle de l'urine surtout, lenteur des phénomènes digestifs par le défaut d'action de l'estomac et des intestins, appétit tardif à revenir, etc. 6°. Dans diverses affections

body, because every general modification in them will necessarily produce proportionate changes in the same system of vessels throughout the whole of the internal organs, and consequently in the capillaries of the mucous membrane. When the action of the superficial vessels is enfeebled, blood is determined to the internal organs in quantity according to the severity of the depressing cause, but, if on the contrary, it is greater than natural, this fluid, possessed of additional oxygenated properties, is equally distributed throughout the system.

générales de la peau, certaines portions des membranes muqueuses sont presque toujours affectées. Dans la fièvre rouge, la gorge souffre presque toujours sympathiquement. Ce phénomène est très-commun dans la variole. 7°. Dans les dernières périodes des lésions organiques des viscères, comme dans les phthisies, les maladies du cœur, les engorgemens du foie, les cancers de matrice, etc., les membranes muqueuses s'affectent comme les surfaces séreuses. L'espèce d'atonie où elles tombent, y détermine un flux plus abondant de sucs muqueux qui s'altèrent alors, deviennent plus fluides, etc. : de là les diarrhées qu'on nomme colliquatives, diarrhées qui sont alors aux surfaces muqueuses, ce que les hydropisies sont aux surfaces séreuses. 8°. C'est encore à cette atonie qu'il faut attribuer les hémorragies pectorales qui arrivent si fréquemment dans les derniers temps des maladies organiques, dans celles du cœur spécialement. Depuis le peu de temps que je suis à l'Hôtel-Dieu, j'y ai déjà vu mourir et ouvert plus de vingt malades de ces affections presque oubliées, avant M. Corvisart, de tous les praticiens : or je n'ai observé que quatre exemples où des hémorragies passives du poumon n'aient pas été l'avant-coureur de la mort.—*Anatomie générale article III. Propriétés du système muqueux.*

It has often been stated by medical writers, in endeavouring to account for derangement of the bowels on the external application of cold, that they are disturbed in consequence of the cutaneous function being no longer capable of throwing off its ordinary secretions. It is, therefore, inferred, and perhaps justly, that the cutaneous secretions are, under these circumstances, much diminished, but admitting them to be so, it does not necessarily follow, that the function of the bowels is increased in order to evacuate the matters that should otherwise have been disposed of, or that they are at all oppressed by them.

The cutaneous secretions are in general more or less abundant, according to the degree of energy possessed by the vital powers. When the body is excited by exercise, these secretions are proportionately augmented, when depressed by any cause whatever, proportionately diminished. . Now, in both cases, the quantity evolved is great or small, according to the necessities of the system ; and hence, it is a pure assumption to state, that when the action of the superficial vessels is enfeebled, the bowels are inordinately excited for the purpose of supplying the defective

functions of the skin. The secretions of the bowels are generally augmented when their numerous capillaries are in a state of congestion or irritation. The latter condition may perhaps, always depend on increased vascularity. During the operation of purgative medicines, frequently in cases of mental emotions of a depressing character, and on the application of cold to the surface of the body, the secretions are abundant.

Purgatives—mental emotions—and cold, occasion the same congestive or irritable state of the capillaries of the bowels. The action of heat is the converse of that of cold. The former stimulates the superficial capillaries, in consequence of which, they receive more blood than usual, a modification in the sanguiferous system which withdraws from the internal organs a quantity of the vital fluid, and thus facilitates its chemical changes in the lungs, giving to it additional oxygenated properties which maintain in vigorous action the powers of life long after the primary exciting cause has subsided.

The following passage from BROUSSAIS is a

curious specimen of reasoning on the influence of heat and cold. To attempt to prove that the latter when just above the freezing point, acts in the same manner as the former, shews that he had no very precise notion of the operation of either, and many other passages might be selected from his writings, and those of his commentators, in corroboration of this opinion.

“L’air humide et froid dispose beaucoup moins la muqueuse du colon à la phlogose que l’air humide chaud, et c’est ce qui dépose en faveur du raisonnement que nous venons de faire sur la manière d’agir de ce dernier. Tous les médecins qui ont voyagé dans des latitudes opposées savent que la dysenterie est proprement la maladie des hommes septentrionaux transplantés dans les régions méridionales. Cependant l’air froid, et surtout froid et humide, quoiqu’il soit beaucoup moins chargé de cette espèce de corps étrangers auxquels nous avons reconnu la propriété de préparer la muqueuse colique à la phlogose, ne laisse pas d’en contenir quelquefois assez pour produire cet effet. Il suffit pour cela que sa température soit quelque chose au-dessus du

degré de la glace. En ce cas, sa manière d'agir se rapporte encore à celle de l'air chaud et humide.

“Mais l'air froid, supersaturé d'eau, prédispose encore la membrane dont nous parlons à la phlogose de plusieurs autres manières : 1^o, en offrant à la transpiration générale un obstacle qui détermine sympathiquement, dans l'appareil muqueux de la surface interne du colon, un surcroît d'action destiné à suppléer à l'évacuation cutanée. C'est ainsi que doit s'expliquer l'action du froid sur toutes les surfaces internes : &c.”*

It is not the object of this inquiry to point out the particular effects produced by the better oxygenation of the blood in the conditions of the mucous membrane, but to trace, generally, the nature of the relations existing between it and the surface of the body, illustrating those relations by a brief explanation of the action of the more important external agents on the superficial capillary system. The principles which elucidate the influence of external heat and cold on the

* Histoire des Phlegmasies. Vol. III. p. 26.

delicate functions of the bowels, also explain the operation of internal stimulants and sedatives.

The mucous membrane possesses no relations to the circulatory system, which differ much from those of the abdominal viscera, and hence when the motory organs of the blood are disordered, the functions of this membrane, in common with those of the other chylopoietic viscera, are liable to be deranged.

It does not, however, follow, admitting that each of these organs, when thus disordered, receives an additional quantity of blood, that they will exhibit an equal degree of morbid derangement. As the different organs are not all possessed of the same delicate structure, and do not exercise the same important functions, it is clear that though the whole animal system may be disordered, they will not all be deranged to the same extent.

A minute explanation of the different agents engaged in the propulsion of the blood, which are capable of disturbing the circulatory apparatus, would occupy more space and time

than can with propriety be devoted to it here; and such an explanation is unnecessary, as the influence of these agents is fully considered in a subsequent part of this Treatise.

It may, however, be proper to state, that a knowledge of the manner in which they act, at once exposes and accounts for the fallacy and imperfection of the views of BROUSSAIS respecting the nature and origin of gastro-enterite, dysentery, cholera, and other diseases. In the consideration of these disorders, his attention was fixed too exclusively on some one organ, regarding it as the cause of the whole mischief: whereas its morbid condition is generally an effect co-existing with many other similar effects, which were either altogether overlooked by him, or regarded only as originating in the derangement of the particular organ to which he was, at the time, giving a too exclusive attention, whether it happened to be the stomach, or any other of the abdominal viscera.

The application of leeches in the treatment of the foregoing diseases is with him a favourite line of practice. And he concludes from the success which attends it, that the

accuracy of his pathological views is fully established. It would, however, be easy to show that other remedies, very different in their operation, would be more generally efficient in the treatment of the same disorders, and yet it would be unphilosophical to conclude that such remedies afford evidence in direct confirmation of the particular pathological principles which led to their adoption.

BROUSSAIS has endeavoured to show that idiopathic fevers have no existence, i.e. fevers not necessarily connected, as they have been hitherto commonly regarded, with inflammation; and though his reasoning on this subject is on the whole just, he lays down no general principles, the result of an intimate acquaintance with the laws of organic and animal life, which satisfactorily explain the origin of the striking diversities in the character of fevers—the nature of the causes which influence their progress and termination, whether this be favourable or otherwise, or which suggest a proper and efficient mode of treatment.

His errors on these important subjects may be traced almost altogether to his limited

knowledge of the *relations subsisting between the more vital organs of the body and the functions of the circulatory system*. The nature of the relations subsisting between the mucous membrane and this system, as illustrated by the action of depressing agents, is too evident to require any additional remarks.

Internal stimulants, whatever be their nature, or mode of action, whether they produce a direct and general acceleration of the motions of the heart and capillaries, or exert only a partial and indirect influence upon them by invigorating the functions of the respiratory organs, occasion, in either case, important modifications in the complicated actions of the body, *in consequence of the changes effected in the natural relations subsisting between the circulatory system and the numerous organs composing the animal machine*. The two extremes of fever, the inflammatory and the typhus, and all the intermediate kinds will be thoroughly understood when these relations have been fully investigated and elucidated as they exist in the diversified forms of disease. The mucous membrane is variously affected in these different fevers : the chief causes of its numerous modifications are the organ primarily dis-

ordered—the duration of the disease—the treatment that has been adopted, and peculiarities of constitution. To enter here into a minute examination of these several circumstances and to point out the particular manner in which they operate in modifying the character of fever, would be departing too widely from the broad line of general inquiry, and entering upon the consideration of subjects that will be better reserved for future illustration in a subsequent part of this Treatise.

Indigestion, occurring particularly in females, co-existing with, or occasioned by, a defective action of the uterine functions, will afford additional evidence in corroboration of the remarks already made, as a knowledge of its origin and symptoms, will prove still further, the importance of being well acquainted with the relations subsisting between the more vital organs and the sanguiferous system.

I have studied with great attention, for several years, the diseased condition of the animal economy prevailing during uterine derangements, and I am entitled to state it as an opinion founded upon accurate and extensive observation, that the functional dis-

order, and the obvious structural modifications, both of which frequently co-exist to an alarming extent, originate in, and are continued by, irregularities in the action of the sanguiferous system : an opinion which is further strikingly confirmed by the fact, that the measures which almost immediately remove these irregularities, are by far the most efficient in the restoration of health.

The means usually employed are rather palliatives than active agents, appearing to assist the powers of nature, but really contributing very slightly to their easy and vigorous operation by removing the obstacles opposed to their free exercise.

In some diseases the most successful plan of treatment is that which affects the system in the mildest manner, being confined to the exhibition of the gentlest aperients or the simplest tonics ; but in cases of indigestion occurring during uterine derangement, if such a term can be justly applied to those in which, whilst the whole system is disordered, the digestive organs are particularly affected, the great practical error lies in not acting with sufficient energy, employing remedies calcu-

lated to apply rather to effects than to causes. Unless the properties and distribution of the blood are speedily improved and regulated in these cases, structural disease manifests itself in different organs, rendering the disorder extremely difficult to cure. The mucous membrane is sometimes deranged throughout its whole extent, and always exhibits symptoms of disease in some of its divisions. At one time, the lining membrane of the trachea, bronchi and their numerous ramifications are considerably affected, at another, that of the stomach or some part of the alimentary canal.

The mucous membrane and the whole of the internal viscera, have, from the first general disturbance of the sanguiferous system, been, occasionally, more or less the seat of disease. The apparent situation of it, and the degree of its severity, depend on circumstances which have been partially considered in the foregoing pages.

In the further prosecution of this inquiry concerning the proper method of studying pathology so as to improve the Science of Medicine, the following objects will be closely kept in view :—

1st. Local diseases in general.

2d. The phenomena of inflammation and congestion.

3rd. The manner in which general disease is produced, or influenced by local diseases, and the converse of this proposition.

4th. The proper mode of performing dissections so as to lead to the establishment of sound pathological principles.

In the foregoing pages allusion has been made to several local affections which, however, were either acute in their nature, or were not mentioned for the purpose of pointing out the exact and intimate connexion existing between them and the conditions of the vital powers. In the further consideration of this subject, my observations will refer to chronic rather than acute diseases, since it will be my object to shew more precisely than has yet been done, the relations which such diseases bear to the different existing states of the constitution. In the excellent work of ABERNETHY, on "Local Diseases," there are many ingenious and just observations—observations that cannot be too highly esteemed, or too closely studied, by the practitioner; it is, however, sufficiently evident *that their*

value consists rather in the enforcement of simple and judicious rules, ascertained by experience to be good, than in the developement of any new or enlarged physiological principles.

In numerous parts of his work he has shewn, in a most satisfactory manner, by a reference to effects, that a very close relation exists between local diseases and the general condition of the system, proposing a plan of treatment which has, in many cases, been found eminently successful; it will not, however, be doubted, that a more accurate knowledge of this relation will elucidate various phenomena altogether unexplained by him, and also suggest important practical improvements.

The justness of these Strictures will be amply corroborated by the following passages which occur in his work “On the Origin and Treatment of Local Diseases:”—“The connexion of local disease with general disorder has been often remarked; it has been formerly attributed to impurity of the fluids; a theory which is not irrational. Imperfect digestion must influence the qualities of the blood, and all parts of the body may be affected from this source. But in accounting for the reci-

procal influence of disorders of the head and the digestive organs on each other, the modern explanation of these phenomena, *by means of sympathies*, is perhaps preferable. Afflicting intelligence will destroy the appetite and produce a white tongue in a healthy person ; and a blow on the stomach disorders the head. These phenomena take place independently of the blood, and can only be explained by admitting that disturbance of one organ immediately affects another.”*

In another part of the same work he remarks :—“ The cure of local diseases by means that cannot be supposed to act otherwise than by correcting errors in the functions of the digestive organs, inclines me to differ in opinion from those who consider the local diseases alluded to, as the effect of impurity of the fluids, and to coincide with others, who consider them as the result of general irritation, frequently induced by that of the abdominal viscera.”†

In addition to these passages I shall here introduce only one more, in order to show

* Page 65.

† Page 262.

the justness of the preceding animadversions. It is important, as it minutely describes certain symptoms occurring in a condition of the system regarded by him as constitutional, requiring for its cure the blue pill, as well as strict attention to diet, and hence proving, as he imagines, that the symptoms are sympathetically excited, and do not arise from a morbid state of the fluids :—

“The actions of the heart seem to me also to become disordered from sympathy with the stomach. That palpitations, and feeble or intermitting actions of that organ, arise from this cause, is proved by their ceasing when the state of the stomach becomes changed. The palpitations which take place after eating, in cases where the heart is irritable, further evince the sympathy which exists between these organs. Surgeons are occasionally consulted on cases of palpitations of the heart, which the patients mistake for aneurisms ; and I have seen many instances where a great degree of palpitation led to a belief that some organic affection existed. This has ceased on an amendment of the general health, apparently arising from an amelioration of the state of the digestive organs, and the patients

have continued in perfect health. I have not collected any accurate narratives of the cases that I have seen : none at least which I could properly present to the public as a proof of the fact. There is nothing, however, of which I am more perfectly convinced ; for I have felt it to be true in my own person. After considerable and unusual fatigue, I was seized with pain, and a sensation of coldness in the region of the stomach. I had no appetite, and the biliary secretion was suppressed. Whilst this disorder continued, which was for many weeks, my pulse intermitted very frequently, and I was distressed with hypochondriacal sensations. Upon an alteration in the state of the digestive organs, and a renewal of the biliary secretions, which happened very suddenly after taking five grains of the pil. hydrag. my pulse became perfectly regular, and my mind tranquil.”*

It is sometimes exceedingly difficult to ascertain the origin and nature of chronic diseases of the digestive organs, though occasionally there is little difficulty in detecting them. The causes which produce chronic diseases

* Opus Cit : P. 257.

are various, though it may be easily shown, that the natural tendency of all such causes is to disorder the qualities and distribution of the blood, and that the severity of the disease is, also, proportionate to the changes occasioned in the functions of the sanguiferous system. Among these causes we may enumerate mental emotions, the vicissitudes of the seasons—a blow on the stomach or head—food difficult of digestion—fatigue of body or mind—local diseases—the breathing of impure air, or sedentary pursuits. These various circumstances all affect the digestive organs in consequence of the changes which they produce in the properties and distribution of the blood. An explanation of any one of these causes will satisfactorily prove the truth of this opinion. *All sedentary pursuits, for example, are injurious to health, because they prevent the necessary oxygenation and equal distribution of the blood.* The numerous functions of animal and organic life cannot be accurately performed when the natural conditions of the sanguiferous system are disturbed, and under the circumstances just mentioned, they are invariably disordered. The stomach, from the facility, perhaps, with which we become acquainted with its slightest

derangement, may appear the first, and for a while the only organ diseased, though at the same time the capillary system of the whole of the internal viscera may be similarly disordered.

ABERNETHY appears to have thought that this system of vessels is generally affected in cases of indigestion, but from the following passage it is evident that his ideas on this subject were not clear:—"The observations which I have made in surgical cases, lead me also to attribute many hæmorrhages, and particularly those from the nose, to a sympathetic affection of the heart and arteries, excited by disorder of the digestive organs. Indeed the whole capillary system of the body seems evidently to be sympathetically affected by the stomach."*

In a remarkable passage, in which this eminently practical surgeon alludes to his own illness, it is clear that the whole of the vital powers were deranged from an imperfect circulation, and an unhealthy state of the blood, and not from any mysterious sympathy

* Opus Cit., page 259.

being excited between these powers and the stomach. The various symptoms which he describes cannot be satisfactorily explained on any other supposition. He states that the manner in which local diseases were cured by him proves that the digestive functions, and not the fluids, were diseased, because the means employed were not, in his opinion, calculated to influence the latter. The usual remedies recommended by ABERNETHY were the blue pill, a simple aperient mixture, daily exercise, and a strict attention to proper diet. Now as each of these is separately capable of effecting important changes in the qualities and distribution of the blood, it cannot be doubted that, when used in conjunction, they would most decidedly promote this result. The remedial measures, therefore, prescribed by ABERNETHY, in the treatment of local diseases, were eminently calculated to produce striking modifications in the fluids.

Many local diseases originate in constitutional disorder, which is itself, however, frequently produced by diseases of this kind. In many cases of recovery, related by ABERNETHY, in his "Treatise on Local Diseases," constitutional derangement was the real cause of the

particular disorders which were cured by the treatment he recommended ; and as this treatment tended materially to correct such derangement, his practice would often be eminently successful in such cases. If local diseases were the cause of the constitutional derangement, they would, of course, be found much less tractable, under such a plan of treatment, than if they had been occasioned by it. In a practical point of view, a knowledge of this distinction is of great importance, as it will materially modify the selection and employment of remedies : if the disease arise from constitutional disorders, our aim will be to improve the general health ; if from local diseases, it will be two-fold—to improve the general health, and to attend particularly to the condition of the local affections.

Pathologists have divided diseases into two classes, in reference to the different influence they are supposed to exercise on the sanguiferous system :—

1st. Those which disturb the general circulation.

2ndly. Those which disturb only the capillary circulation.

There are undoubtedly many diseases which belong to the latter class, and which may continue for years without affecting the general circulation ; it is, however, equally indisputable that many of those which are referred to the former, may with much greater propriety be referred to the latter. It will scarcely be doubted, that Bichat, in the following passage, in which he argues the almost perfect independence of the capillary of the general circulation, deviates widely from truth. Some of the diseases to which he alludes cannot be shown to exist exclusively in either of the two circulations :—

“ Il y a manifestement deux genres de maladies relatives à la circulation : 1°. celles qui troublent la générale ; 2°. celles qui affectent la capillaire. Les différentes fièvres forment spécialement le premier genre ; les éruptions diverses, les tumeurs, les inflammations, etc., produisent le second : or, quoique beaucoup de rapports lient le second au premier, il n’en est point essentiellement dépendant ; en voici la preuve : les fièvres ne peuvent évidemment exister que dans les animaux à gros vaisseaux, dans ceux où les fluides se meuvent en masse ; elles sont nécessairement étrangè-

res aux zoophytes et aux plantes, qui ne jouissent que de la circulation capillaire : or, cependant ces dernières classes d'animaux et tous les végétaux sont sujets à toutes les affections qui troublent la circulation capillaire. Ainsi voit-on s'élever sur les plantes une foule de tumeurs ; ainsi leurs plaies se réunissent-elles ; ainsi deux portions de la même contractent-elles ensemble des adhérences, comme la greffe le prouve. Sans doute les maladies qui siègent dans leur système capillaire sont différentes de celles des animaux, par leur marche, leur nature ; mais elles présentent toujours le même caractère général, parce qu'elles dérivent des mêmes propriétés, de la sensibilité organique et de la contractilité insensible.

“ Puisque les maladies du système capillaire ne sont point essentiellement liées à celles du système vasculaire général, elles n'en dépendent donc pas : donc la circulation du premier n'est qu'indirectement subordonnée à celle du second. Voilà pourquoi les deux circulations peuvent se séparer, pourquoi plus de la moitié des êtres organisés n'ont que la capillaire. C'est celle qui est la plus importante, puisqu'elle verse immédiatement les matériaux de

la nutrition, de l'exhalation, de l'absorption : aussi existe-t-elle chez tous les êtres organisés. On n'en conçoit aucun sans elle, parce qu'on n'en conçoit aucun qui ne se compose et ne se décompose habituellement par la nutrition."*

Although it is possible for parts of the capillary circulation to be alone affected, they will always be influenced by changes in the general circulation. It cannot, indeed, be otherwise, as the former is simply the termination of the latter. A particular attention has of late years been paid to the capillary system, both in this country and on the continent, for the purpose of ascertaining its exact condition in different diseases, and various doctrines have been formed on the changes observed in it, which are either imperfect, from being founded on too partial observation, or erroneous from a misinterpretation of the morbid phenomena apparent in various disorders. Pathologists, who have studied this subject by confining their observations almost exclusively to the capillaries, without endeavouring to ascertain the nature of the connexion existing between them and the gene-

* *Anatomie Générale. Sec. VIII. De la Circulation des Capillaires.*

ral circulatory system in disease or health, failed to acquire clear and enlarged views of the origin, nature, and treatment of the numerous diseases which have formed the subject of their investigation.

In proof of the correctness of this assertion, it is only necessary to adduce the following passage from one of the latest pathological works that has been published, which is also the best. The author is detailing the opposite opinions entertained of the condition of the capillaries in inflammation :—

“ 1st. The fact of increased determination is not established. In its present state it is a mere assumption. 2d. Increased determination is not necessary to the production of the effect. When the capillaries of any part are unusually loaded, this may take place from the blood not being removed with the same regularity and in the same proportion in which it is conveyed, with the same facility as by supposing an increased current. 3d. Even admitting the current to be increased through any set of capillaries, it is impossible to discover the agents of such a process. It is clear it cannot be the heart. And to suppose the capillaries capable

of this, is to ascribe to them a power which they have not been proved to possess.

“ Against the hypothesis of increased force, and increased velocity of circulation, various arguments may be urged ; and several of these depend on the circumstance, that this hypothesis also has been assumed on very insufficient grounds. 1st. The increased number of the arterial pulse does not demonstrate that the blood is moving more rapidly than in the ordinary circumstances of health. It merely shows that the heart contracts more frequently in a given time than usual. 2d. The increased number, or strength, or tension of the arterial pulse does not indicate that the blood is moving with greater force, or that the arteries through which it is moving are acting with greater power, but rather that the heart is contracting much more frequently, in order to overcome some obstacle. 3d. It does not appear that the increased number or force of the pulse, as manifested by the contractions of the heart, depends on any other cause than the vital irritation occasioned by a local stimulus of a morbid nature. 4th. The throbbing of inflamed parts proves nothing more, than that the shock communicated from the

heart along the arterial tubes is rendered more sensible, first, by their dilated and distended condition ; and, secondly, by the greater quantity of matter deposited in and around these vessels.”*

It will require few words to prove that there is little truth in the two first propositions in this passage respecting the pulse, and it is very evident from the the third, that the cause of the excited action of the heart was by no means clearly understood.

The number of the arterial pulse may be at one moment greater than at another, without the whole mass of blood passing, in a given time, more frequently than usual through the lungs, but if the number be greater, and the strength of the pulse proportionately increased, the mass of blood will necessarily circulate in any given period more frequently through these organs.

It is proved in the “Experimental Inquiry,” that the blood is more or less oxygenated according to the frequency with which the

* Elements of General and Pathological Anatomy. Sec. II. System of Capillary Vessels, &c. By DAVID CRAIGIE, M.D.

whole mass of it is transmitted, in any specified time, through the lungs, and that when the circulating fluid possesses additional vital properties, the pulse is both strong and frequent, while under opposite circumstances it is never strong, though generally frequent, because the blood is not then endowed with stimulating properties to a sufficient degree to excite the heart and arterial system to vigorous action. Dr. CRAIGIE states “*that the heart is contracting much more frequently, in order to overcome some obstacle.*” Of the nature and situation of this obstacle we are left to form our own conjectures, and it is certainly not easy to imagine, how any obstacle can possibly exist to invigorate the contractions of this organ. According to my view of this subject, the contractions of the heart are not accelerated *for the purpose of overcoming an obstacle, but are, on the contrary, effects arising from the disturbed distribution of the blood.* The passage quoted betrays the want of an intimate acquaintance with the functions of the sanguiferous system, without which, it is not possible to form correct notions on the subject of pathology. All the important vital actions of the animal economy are performed by means of the capillaries, and all diseases, whether local

or general, may be justly considered as seated in these minute vessels : hence, it is evident, that a knowledge of their several functions, and the relations which they hold to the general circulatory system, would be attended with the greatest advantages to the Science of Medicine, as the proper understanding of them is calculated to remove much of that obscurity which involves the seat and nature of an extensive class of diseases, chiefly affecting the chylopoietic viscera or the respiratory apparatus, the origin and character of which diseases cannot be at all explained on existing pathological and physiological principles. The diseases to which I allude are generally considered local, that is, situated in some particular part of the body, as the stomach, lungs, liver, or certain portions of the alimentary canal—diseases to which females and persons of sedentary habits, or melancholic temperaments are most subject. The term extensive class of diseases may, perhaps, lead the reader to imagine that some of these are strikingly different in their origin and nature. They do, indeed, vary sufficiently in these respects to allow the nosologist to institute distinctions between them, and, if unacquainted with certain conditions of the system, com-

mon to almost all of them, he will very probably regard them as perfectly independent affections, though they are intimately related in their nature, arising generally from the same source, and differing only in the number and character of their symptoms, according to the susceptibilities of the constitution, the nature and duration of the exciting causes, and the particular kind of remedial measures employed in the treatment of them.

If the stomach be the organ affected, although there may be an evident degree of disorder existing at the same time in other parts of the body, the disease is immediately designated indigestion, and treated as such ; or, if the lungs be considerably deranged, a derangement which is indicated by difficult breathing on slight exertion, frequent cough, and pain in the chest, either constant, or occasional, the disease receives a name which refers it solely to these organs, being probably regarded as the first stage of phthisis ; or, if the liver should be more particularly disordered than the above mentioned organs, it is said to be the seat of the disease. By adopting this confined and erroneous mode of investigating the seat and nature of the morbid phenomena, the causes

of the general derangement are overlooked, though they are really the origin of these dissimilar diseases, which, however little connexion they may appear to have with each other, actually differ only in certain immaterial points, not in those constitutional conditions which are characteristic of them all.

The striking symptoms of resemblance are found *in the deteriorated properties of the circulating fluid, and the irregularity of its distribution, or in what necessarily follows from these two circumstances, congestion of the internal organs.* If these pathological views are correct, important modifications suggested by them will be introduced into the practice of medicine: the attention of the practitioner in the investigation of diseases will be directed not merely to one organ, but to all those morbid conditions of the system in which the particular disorders originate, or by which they are aggravated. Were this the proper place, I might here mention cases of extraordinary interest, treated successfully according to the principles already laid down, but I shall not enter into any particular enumeration of them, as it might be objected, and with considerable truth, that practical success is no direct

evidence of the accuracy of pathological views.

II. The subject of inflammation and congestion presents no ordinary difficulties to the inquiring mind. It is well known that a great discrepancy of opinion exists in regard to the phenomena of the former. Some contend that the blood in the capillaries, during inflammation, circulates with increased velocity, others that its motion is decidedly impeded.

The experiments of Dr. THOMSON, instituted for the purpose of determining this question, are in favour of both theories. It is not very agreeable to speculative minds, distinguished for their bold spirit of theorizing, to believe that their own doctrine is only partially correct, and that another, widely opposed to it, is equally worthy of adoption. The different opinions entertained on this subject are, however, of trifling importance to the broad line of argument pursued in this inquiry, as the distinctions I shall endeavour to point out will be extremely general, having for their object the developement of practical principles in place of speculative

refinements, which exercise only a remote or indirect influence on the proper selection and employment of remedies. It is sometimes scarcely possible to confound acute and chronic inflammation, though it is, occasionally, difficult to say which of the two exists, or, if both co-exist, which has the predominance.

It is not in our power to ascertain the exact condition of the capillaries in acute and chronic inflammation ; all we know is, that they are, at one time, congested, and that, at another, the blood circulates in them with accelerated force. To attempt to discover the particular vital changes produced in the constitution of the vessels themselves by the process of inflammation, or to shew how such changes modify the nature and duration of disease, would conduct us into the regions of speculation,

In the following passage BICHAT labours to shew, that the phenomena of inflammation are attributable to alterations in the constitution of the capillaries :—

“ La pénétration du système capillaire par le sang, est donc un effet secondaire dans l'in-

flammation. *Le phénomène principal, celui qui est la cause de tous les autres, c'est l'irritation locale qui a changé la sensibilité organique* : or cette irritation locale peut être produite de diverses manières ; 1°. par un irritant immédiatement appliqué, comme par une paille sur la conjonctive, par les cantharides sur la peau, par des vapeurs âcres sur la surface muqueuse des bronches ou des fosses nasales, par l'air atmosphérique sur tout organe intérieur mis à découvert, comme on le voit dans les plaies, etc. ; 2°. par continuité d'organes, comme quand une partie de la peau, de la plèvre, etc., étant enflammée, celles qui sont voisines s'affectent aussi, et que le sang y afflue, comme quand un organe étant malade, celui qui est voisin le devient, par les communications cellulaires ; 3°. *par sympathies* : ainsi la peau étant saisie par le froid, la plèvre s'affecte sympathiquement ; sa sensibilité organique s'exalte ; le sang y pénètre aussitôt de toute part. Que cette propriété soit exaltée d'une de ces trois manières, dans le système capillaire, c'est absolument la même chose pour les phénomènes qui en résultent. Par exemple, que dans la plèvre elle s'exalte parce que l'air est en contact avec cette membrane par une plaie de poitrine, parceque le

poumon qu'elle recouvre a été préliminairement affecté, ou parceque le froid a surpris la peau en sueur, l'effet est à peu près analogue, sous le rapport de l'abord du sang dans le système capillaire.*

The reasoning of BICHAT, on the origin of inflammation, is, in a great degree, fallacious. If he had possessed clear ideas respecting the action of the two grand classes of agents which excite inflammation—the external and internal—he would not have made the assumptions he has : a more simple mode of explaining the phenomena of disease, admitting of something like positive evidence, would have suggested itself to his mind. It is probable that many of the internal agents cause inflammation and great derangement of the circulation, from the constitution of the capillaries being modified by them, but it is by no means easy to determine whether these effects are produced by exciting or depressing their vital energies.

It might, however, be shewn, that many of the internal agents do not produce inflammation by any primary modification in the constitu-

* Anatomie Générale, Système Capillaires.

tion of the capillaries, and that the influence of all the external agents, except those of an irritating nature, is to be explained entirely on other principles. If cold, for example, be suddenly applied to the surface of the body, and inflammation of the bowels be the consequence, this effect is not produced by any sympathy between the capillaries of the diseased organs and the superficial ones primarily affected ; all the changes caused in the constitution of the former, being wholly attributable to the determination of blood to them, arising from the diminished distribution of it on the surface of the body. This single illustration will serve to show that the production of inflammation may occasionally be explained on principles very different from those of BICHAT, and equally opposed to the common views of pathologists on this subject.

A knowledge of the operation of the numerous agents, which disturb the powers of life, cannot fail to elucidate the phenomena of inflammation, and thus introduce great improvement into the practice of medicine. Dr. CRAIGIE remarks, “that during the mor-

bid process of fever the whole capillary system is unduly distended and loaded with an inordinate quantity of blood, which really moves more slowly and imperfectly than during health. *We have no facts which enable us to determine what induces this peculiar and excessive accumulation.*”* Now this excessive accumulation is as easy to explain as the invigorated circulation of the blood in cases of inflammation of the lungs, for which, in the foregoing pages, a satisfactory reason has been already assigned.

The congestion of the internal organs arises from various causes, *all tending, however, to disorder those functions which oxygenate and circulate the blood.* An accurate acquaintance with these causes will, in my opinion, account for the occurrence of death and the morbid appearances observed occasionally in cases of chronic inflammation of the mucous membrane, much more satisfactorily than the reasoning of BROUSSAIS in the following passage :—

“ Les malades qui succombaient un peu plus tard, après avoir passé de l’agitation à l’af-

* Elements of General and Pathological Anatomy. Page 178.

faissement, et avec quelques symptômes de la fièvre adynamique putride, surtout la fétidité de l'haleine, m'ont quelquefois offert une muqueuse noire, fragile, et d'une odeur gangréneuse. Ici le sphacèle est manifeste ; mais on ne le trouve pas toujours dans les cas qui semblaient le promettre davantage.

“ Il n'est encore ici que le résultat de l'excès de la douleur. Il s'est affectué, parce que le malade a résisté à ses souffrances assez long-temps pour permettre à la membrane, déjà tuée par la douleur, de passer à la décomposition putride avant la mort, ou du moins avant l'ouverture. Les érosions n'ont lieu que partiellement, dans les lieux les plus agacés, et semblent être des commencemens d'ulcère ; elles appartiennent à toutes les nuances de l'état aigu. L'irritation que les vers exercent opiniâtrément dans certains points rétrécis, qui sont sans doute des cryptes, peut les produire quelquefois ; mais je les ai aussi rencontrées sans qu'il y eût aucun de ces animaux dans les voies digestives.”*

TRAVERS, in his inquiry concerning constitutional irritation, frequently alludes to the

* Histoire des Phlegmasies. Vol. III. p. 72.

sedative influence of pain, a subject on which his opinions are fundamentally the same as those of BROUSSAIS. The explanations proposed by both are founded upon assumptions which can scarcely be considered even probable. No convincing evidence is adduced to prove that pain exhausts the nervous energy, or directly affects the structure of an organ. The fact of a person dying, during an operation, from an acute or prolonged pain produced by it, or in consequence of disorganization in the mucous membrane, under the circumstances specified by BROUSSAIS, cannot be adduced as direct evidence in corroboration of the views entertained by him. The *causes* of painful or pleasurable feelings may exist in any part of the system; but they must not be confounded with the *sentiment* of pain or pleasure excited in the mind. They stand to each other in the relation of cause and effect, and the latter exerts an influence very different from the former. The *causes* of pain may destroy the vitality or structure of organs, but the pain itself, which, correctly speaking, exists only in the mind, can exert no such power.

Pain is, however, undoubtedly capable of

causing death, though not in the way generally supposed, *but by occasioning changes in the respiratory functions, by which they are either entirely arrested or seriously disturbed—changes which satisfactorily explain the effects produced, whether these be death or only temporary disorder.*

There is little difficulty in discriminating between acute inflammation and congestion, but a great difference of opinion may certainly exist respecting the phenomena which characterize chronic inflammation and congestion. It is scarcely possible to confound chronic inflammation which has existed long in any gland, joint, or organ, with those disordered conditions of the system which the term congestion, as used in this Inquiry, is intended to indicate. It may, however, be questioned, whether that state of the internal viscera existing in cases of typhus or continued fever be inflammation or congestion, though both will perhaps be allowed to co-exist.

The internal organs, under such circumstances, are generally more or less congested; some, or perhaps, particular parts of them may, from peculiar causes, which it is unnecessary

in this place to investigate, be in a state of inflammation. BROUSSAIS, from having frequently observed structural modifications in the chylopoietic viscera, in cases of fever, dysentery, or cholera, attributes the origin of these diseases to an inflammatory process. These modifications, however, are the effects of causes, with the operation of which he seems to be unacquainted, and co-exist with much general disorder, the exact nature of which he does not attempt to explain.

It is not my intention to point out the precise lines of demarcation by which some would distinguish chronic inflammation from congestion. The former, whether arising from an acute affection, or the slow operation of depressing causes, is preceded by congestion of the capillaries, and is cured, or ameliorated according to the degree of our success in removing the surcharged state of the vessels. I have previously alluded to the condition of the animal economy in females, in whom the uterine functions are disordered, the catemenia being either wholly or partially arrested. Now this condition of the internal organs generally, may be properly designated by the term congestion, not meaning, however, to deny, that

chronic inflammation may at the same time exist in several organs. Congestion, which first takes place in the series of morbid actions preceding the derangement of these functions, affects not only one part of the system, but more or less the whole of it, as the properties and circulation of the blood are invariably disordered by every such derangement.

Chronic inflammation appearing at this time, in one organ, or in several organs, arises out of the congestion generally existing, and may, consequently, be considered as the second stage in the series of morbid changes, a phenomenon which has hitherto tended, in a most extraordinary manner, to conceal the true nature of the morbid state of the vital powers, and thus led to the employment of remedies which apply rather to the existing local diseases, than to the generally disordered condition of the system in which they originate.

The explanation I have given of the production of chronic inflammation, by the application of cold, or by sudden depressing emotions, in those cases in which the uterine functions are disturbed during the flow of the catamenia, or immediately before

the time of their usual appearance, satisfactorily accounts for the effects produced, and can scarcely be doubted to be correct.

Chronic inflammation may, in some instances, less obviously arise from the congestion of the internal organs, than in the circumstances here specified, being, in such instances, produced by causes which affect one organ alone, though it may yet occasion, by its severity or long continuance, that generally morbid condition of the vital powers in which it more frequently appears to originate. A full discussion of this important question would necessarily require me to enter on the consideration of the reciprocal influence of organs, a subject which I have already previously noticed in a cursory manner, and which I shall investigate still further in other parts of this Treatise.

From the foregoing remarks on chronic inflammation and congestion, it will appear how difficult it is to offer a definition which clearly separates the two diseases, being, as they often are, intimately blended; the one continually passing into the other in the greater number even of those cases in which, on a

superficial examination, they seem to exist uncombined. Some symptoms, however, strongly characteristic of both, either when they exist alone, or in conjunction, can scarcely fail, on a close investigation, to be observed with sufficient distinctness for all practical purposes. Congestion cannot continue long without producing chronic or acute inflammation, the existence of either, but particularly the latter, being generally supposed to be indicated by local pain and fever.

Daily observation proves that chronic inflammation may make considerable progress without producing fever or pain sufficient to indicate its existence, or, at least, to render the patient acutely sensible of it; it is also equally true, that in many cases, in which congestion alone prevails, there is often much pain, which comes on so suddenly, and is removed so easily, that we can scarcely refer it to inflammatory action. It is probable that the sensibility of an organ may be much increased by a condition of the capillaries which could not justly be designated inflammation, though the truth of this opinion may be denied with seeming plausibility by those who are disposed to attribute every such pheno-

menon to inflammation. Congestion of the internal viscera undoubtedly exists in cases of typhus, continued and intermittent fever, as well as in severe attacks of indigestion, and, in the greater number of instances, chronic inflammation also co-exists with it, though rather as the effect than the cause of it. Congestion, altogether uncombined with inflammation, immediately succeeds violent depressing emotions, but, if it continue long, it speedily produces inflammation.

The phenomena peculiarly indicative of these two affections will be more clearly understood, when those morbid states of the system, which give rise to them, have been closely investigated.

III. The manner in which general disease is produced or influenced by local affections, as well as the mode in which the latter are occasioned or modified by the former, constitutes the next subject for consideration ; on which, however, though very important, I shall not enter at present, as it would be impossible in the narrow limits to which the discussion must here be confined, to do any thing like justice to it. It has been already shewn, in a few

instances, how great an influence general and local diseases exert upon each other : this influence will be more fully understood, when the pathology of local and general diseases has been maturely investigated.

IV. I shall now endeavour to shew how *post mortem* examinations ought to be conducted so as to lead to the establishment of sound pathological principles. The object of all such examinations is either to determine the accuracy of pathological views entertained, or to discover the seat and nature of those diseases which are involved in obscurity : in pursuing this object the pathologist has to contend with great difficulties, which, however, may perhaps be lessened by a few suggestions as to the proper mode of conducting such inquiries, since the difficulties arise rather from a limited knowledge of the natural laws of the system, and the modifications produced in them by disease and other causes, than from the intricate nature of the subject itself.

The mode of treatment we adopt for the cure of any disease is generally suggested by preconceived notions concerning its nature, and there can be no doubt that these notions

considerably bias the judgment in the decision of the inquiries instituted for the purpose of ascertaining, after death, the seat and nature of the disease. The pathologist will, therefore, be liable to mistake the nature of diseases, unless he be intimately acquainted with the functions of the animal economy, both in their healthy and morbid states; he will be misled, perhaps, by the more prominent symptoms, especially if, as is too common a practice, he confine his attention to a single organ instead of directing it to the examination of the whole system.

The truth of these remarks may be illustrated by a case of frequent occurrence. A patient whose lungs appear to be alone affected, were we to judge from the symptoms of occasional cough, pain in the chest, and difficulty of breathing on violent muscular exertion, (though, in the early stage of the disease, these symptoms are so mild as scarcely to interfere with the ordinary occupations of life) is treated by his medical attendant as if the lungs were really the seat of the disease. The phthisical character of the affection becomes perhaps more manifest every day, till the patient in a short time dies. The morbid

appearances discovered on a *post mortem* examination, are adduced as a striking proof of the accuracy of the pathological view previously formed of this disorder.

On opening the chest the lungs are found very much diseased, certain portions of them being indurated, or tuberculous, and although the liver, the spleen, and other organs of the abdomen are found to be in a similarly morbid state, their unhealthy condition is regarded as the effect of the injurious influence of the pulmonary affection.

From numerous and minute investigations, however, I am prepared to assert, *that, in females, the extent of complicated disorder discovered on dissection, in cases of consumption, is less frequently occasioned by primary disease of the lungs, than by derangement of the abdominal viscera, co-existing with the first indications of thoracic disturbance, and arising also from the same general cause.* This assertion might be easily proved by enumerating the symptoms characteristic of abdominal disease, and of a generally disordered action of the whole system. This fact, if duly considered, would expose many absurdities and imperfections in

the views of pathologists, respecting the various species and complications of phthisis.

A knowledge of the condition of the more important organs, when symptoms of consumption first appear, enabling the pathologist to determine the nature and seat, and, consequently, the extent of disease co-existing with pulmonary disorganization, would lead him, during the appalling progress of the latter, to direct his attention to the long and varied train of symptoms arising from the general derangement, instead of confining it solely to that particular class, which appears, on a superficial examination, to belong to the lungs. If it can be satisfactorily shown, that great disorder of the system exists, for the most part, in cases of consumption, arising not so much from disease of the lungs, as from the operation of causes productive of the pulmonary affection, it cannot, in that case, be doubted, that the line of practice adapted to such diversity of disease, will be widely different from that generally pursued in the treatment of phthisis, in which the lungs are regarded as almost the only organs affected.

Some of the most distinguished pathologists

of the day, have formed either imperfect, or erroneous notions of the seat and nature of many diseases, in consequence of their being but partially acquainted with the morbid state of the body, when the lungs, the stomach, or the liver appear the only parts deranged. An examination of the writings of BROUSSAIS, ABERCROMBIE, HASTINGS, WILSON PHILIP, and others, will prove the correctness of this assertion; particularly those of BROUSSAIS, which contain numerous cases that might be adduced as corroborative evidence in support of it, such as those enumerated under the head of gastro-enterite, phthisis, and the different types of fever. One case I shall introduce here, by way of illustration, taken from the Treatise of BROUSSAIS, on Chronic Inflammation :—

“ Catarrhe chronique à la suite de fièvre intermittente.

Le nommé Fevret, âgé de vingt à vingt-deux ans, de taille et de largeur médiocres, tissu mou, corps grasseux, entra, dans les derniers jours de brumaire an XIII, à l'hôpital, n°3, de Bruges. Il avait été traité plusieurs fois, et même guéri de la fièvre; mais il lui restait une légère infiltration; il était toujours

débile, quoiqu'il eût bon appétit ; son teint était d'un jaune paille, et un air de langueur se faisait remarquer dans l'expression de sa physionomie. Il ne se plaignait point de la poitrine ; mais, en l'observant le soir, je m'aperçus qu'il avait une toux sèche assez forte. Je ne laissai pas de lui administrer les diurétiques et les amers, avec une dose d'alimens que je crus proportionnée aux forces de son estomac.

“ Le six frimaire, huit jours après son entrée, environ quarante jours après l'invasion, je le trouvai dans une fièvre très-violente avec un pouls dur et fort. Le soir, il survint des symptômes cérébraux. Il expira dans la nuit, sans râle, mais tout-à-coup, après avoir été vivement agité.

Autopsie.

“ *Habitude.* Le cadavre avait un peu perdu de son infiltration, mais le tissu cellulaire était encore gélatineux. Les muscles étaient à peine diminués, et moins rouges que dans l'état ordinaire. *Tête.* Rougeur, densité de la substance cérébrale, peu de sérosité dans les ventricules, beaucoup dans les fosses occipi-

tales. Dans chaque plexus choroïde une substance à cellules transparentes remplies de gélatine, du volume d'une grosse aveline. *Poitrine.* Le lobe droit adhérait presque partout; son parenchyme était endurci et de consistance hépatique dans les trois quarts de son volume. Je trouvai au centre de cette induration un tubercule plein, et je remarquai qu'autour de lui la carnification était plus solide. Le lobe gauche était encore perméable à l'air, mais très-engorgé. Il y avait beaucoup de sérosité épanchée. Le cœur était sain. *Abdomen.* Le foie un peu volumineux et jaunâtre; peu de sérosité dans le péritoine.

“ Il est aisé de reconnaître chez Fevret une mauvaise constitution du système lymphatique. Le tubercule du poulmon en est une première marque; on en trouve une seconde dans le commencement d'état gras du foie. Comme on ne voit point que la fièvre ait pour effet constant de produire des tubercules, tandis que toujours elle engorge les capillaires sanguins des viscères, on ne doit lui attribuer directement que l'induration sanguine, et regarder le tubercule comme une marque d'une prédisposition à la phthisie, qui, peut-être,

dans la suite aurait entraîné le malade. Cependant, ce tubercule a pu faciliter l'irritation inflammatoire que la fièvre tendait à produire, et rendre mortel un catarrhe qui aurait pu être sans danger. Dans tous les cas, le tubercule n'aurait pas causé seul l'induration, car l'expérience prouve que les tubercules n'enflamment le parenchyme qu'autour d'eux, dans un rayon très-borné, et c'est par leur multiplicité qu'ils mettent les organes hors de fonction. Mais n'anticipons point ; contentons-nous de prouver ici que la fièvre intermittente prolongée et mortelle a souvent pour effet l'induration du poulmon."*

The name which this eminent pathologist gave to this case, as descriptive of its character, designating it chronic catarrh, succeeding intermittent fever, shows how imperfect an idea he had formed of the condition of the system generally co-existing with those particular symptoms which give its designation to this disease.

The traces of disorganization discovered on dissection, in the more important viscera of the body, most probably produced by frequent

attacks of fever, prove that the disease, in the foregoing case, was by no means confined to the lungs or to the mucous membrane of the trachea, but had, on the contrary, extended itself to most of the vital organs. From the notes recently appended by him to this case, for the purpose of correcting certain erroneous opinions stated in the text, it is still more evident that the view he had taken of the seat and nature of the disease, which formed the subject of investigation, was very partial and limited. In these notes he represents the tubercle as the production of bronchial inflammation, and the fat state of the liver as the effect of gastro-enterite.

It cannot be denied that bronchial inflammation is capable of generating tubercles in the lungs, or that this peculiar condition of the liver may arise from inflammation of the stomach and bowels : it may, however, be affirmed, without fear of contradiction, that, in the case in question, there is as much reason to suppose that the tubercle and the fat state of the liver are the causes, the one of bronchial inflammation, the other of that denominated gastro-enterite, as that they are the effects of them.

Pathological errors, similar to those in this case, abound, more or less, in every part of the Treatise on Chronic Inflammation,—a work, however, which, with all its faults, is, unquestionably, one of the most valuable medical productions of the present age. From this case we may judge how much imperfection and fallacy are produced by two very different causes in investigating the seat and nature of diseases, viz.—*the influence of preconceived ideas, and the want of established principles.* When the case was first drawn up, BROUSSAIS had not then embraced those peculiar and, in many instances, sound physiological and pathological doctrines which have of late years rendered his writings so very popular on the Continent; and hence, in his description of structural modifications, detected in various organs, on examination of the body after death, we discover no partiality for any particular theory, and no attempt to support it: the facts being simply stated without any apparent inclination to render them subservient to the establishment of any favourite doctrine. In the notes, however, appended to the case, which were introduced many years after the first publication of the work on Chronic Inflammation, *the modifying in-*

fluence of a systematizing spirit is strikingly displayed: the author endeavouring in these to correct the errors contained in the text, by attributing the tubercle existing in the lungs to bronchial inflammation, and the diseased condition of the liver to gastro-enterite.

It is evident that, though he became well acquainted with structural modifications in the different organs by means of dissection, it did not at first enable him to form enlarged and just views of the seat and nature of the disease he was investigating; his incapacity to do this arising necessarily from *his imperfect knowledge of the natural laws of the animal economy, and of the degree of their disturbance during life*. Without such knowledge it is utterly impossible to form correct pathological principles, because we cannot ascertain from the *traces* of disorganization, discovered on *post mortem* examination, however striking or numerous they may be, the various morbid causes in operation at the commencement of any disease of a complicated character; nor can we discover the different effects and causes in the series of organic changes which take place during the whole course of it.

'The indications of these can be properly appreciated and philosophically applied towards the attainment of just views, only by one who has a comprehensive acquaintance with the nature and extent of the disturbance of the vital powers during the gradual progress of disease, and has minutely traced the conversion of effects into causes which renders the disorder, at every step, more complicated, until, at last, the whole system becomes deranged by it. In the notes of BROUSSAIS, an attachment to a favourite system is strongly manifested, since he attempts to explain, on the influence of bronchial inflammation and gastro-enterite, the different morbid phenomena discovered on dissection, whilst he is continually alluding to the latter disease, as sufficient to account for the very general disorganization of the abdominal viscera in cases supposed to be characterised by a primary derangement of the stomach, or some circumscribed portion of the alimentary canal.

BROUSSAIS was led to form these particular views from a superficial examination of the body during life, the detection after death, of structural changes in situations where pain was felt on pressure, and great relief derived

from the application of leeches. These facts indisputably prove that disease exists in the situations to which he alludes as its exclusive seats : it requires, however, an intimate acquaintance with the natural laws of the system, and of the reciprocal influence which the various organs exert on each other, to determine how much of the general disease discovered in the abdomen, or thorax, is the consequence of the particular disorder of the stomach or bowels.

An intimate acquaintance with the condition of the animal economy, co-existing with gastro-enterite, in cases so designated by BROUSSAIS, would satisfactorily prove that, in the greater number of instances, the general derangement is less frequently attributable to the influence of the local affection (which is almost alone considered by him) *than to the operation of causes productive of both the local and general disease.*

From these cursory observations, it is evident, that *post mortem* examinations are as liable to mislead as to assist the judgment in investigating the seat and nature of diseases. If, however, the pathologist possess a just

and comprehensive view of the laws of the animal economy, such examinations cannot fail to lead to the establishment of correct principles, which will unerringly guide him in this intricate investigation, and enable him to form a correct decision.

The Treatise of Dr. HASTINGS on inflammation of the mucous membrane of the lungs, furnishes abundant evidence of the existence of the same kind of errors, particularly that part of it in which he endeavours to explain the phenomena of acute and chronic bronchitis, and of dropsy arising from inflammation of the lining membrane of the bronchia. In most of the striking cases of chronic bronchitis and dropsy, considerable abdominal disease is acknowledged to have existed in conjunction with these affections, yet this complication of disorders, most evident on dissection, is regarded by Dr. HASTINGS, (and this is the view generally entertained by others) as an effect arising from an inflammation of the mucous membrane of the lungs, *produced by sympathetic action*: but what this *sympathetic action* is, he has not explained, nor has any clear and satisfactory definition of this term been ever given by any one. In a few instances in

which, according to his statement, such complication existed from the commencement of the bronchial affection, it is manifest that he did not understand the nature of those causes which occasioned it, and his pathological principles are consequently as erroneous and defective as those of BROUSSAIS. In corroboration of this opinion, he observes, “we have no other means of explaining the connexion of abdominal disease with chronic bronchitis, than by referring to the *sympathy which is known to take place between these different parts of the animal machine*. That such connexion between different parts of the system does occur, is abundantly proved by the experience of ages.”* From this passage, it is evident, that Dr. HASTINGS possesses but a limited acquaintance with the origin, progress, and nature of such extensive structural changes. The co-existence of abdominal disease and chronic bronchitis is not a phenomenon of rare occurrence, but is found in almost all the striking cases adduced by Dr. HASTINGS as illustrative of the latter affection. It would not be difficult to prove, by the symptoms detailed in most of these

* HASTINGS on Inflammation of the Mucous Membrane of the Lungs. P. 288.

cases, that the greater part of the general disease arises simultaneously from the disturbance of certain vital powers. The following case, taken from the work of Dr. HASTINGS, shows that his knowledge of the natural functions of the system, and of the manner in which they are liable to be deranged, was too circumscribed to admit of his forming correct views of the seat and nature of the diseases which he investigated. A female aged twenty-two, was received into the Worcester Infirmary. "She had caught cold three months before admission, and ever since that time had been troubled with cough and shortness of breath. When admitted, she complained of pain in the right hypochondrium, tenderness in the epigastric region, constant cough with copious expectoration, foul tongue, and irregularity in the bowels." She ultimately died, and, on dissection, "the liver was found enlarged, and its peritoneal coat inflamed. The other abdominal viscera were healthy. There were many tubercles in the substance of the lungs, several of which had suppurated. There are circumstances," he observes, "in this case which render it obviously different from the majority of this description we meet with. The affection of the lungs preceded the disease in the abdo-

minal viscera, *which latter affection did not much influence the former.* The emaciation was rapid very early in the progress of the disease, and the degree of dyspnœa was much greater than it ever is when the abdominal is the primary affection. The cause, too, which gave birth to the disease, was obviously one which acted principally on the lungs, *and was not at all of a nature to affect the digestive organs.*"*

There are several things in this passage which are inconsistent with sound physiological principles, and just reasoning. As, according to the statement of Dr. HASTINGS, the patient caught cold *three months before* admission into the Infirmary, it is evident he could have no very exact knowledge of the condition of the more important organs at the time the cold commenced, or of the degree of general derangement co-existing with the pulmonary affection; so that it was purely an assumption on his part to assert, that the disease of the lungs preceded that of the abdominal viscera. I have seen a great number of cases, in females from the age of sixteen to thirty, in which the lungs and mucous membrane of the bronchia were diseased, where disorder

* P. 354.

of the abdominal viscera was not at all suspected by the medical attendant, as the patient herself did not complain of it, though it was found, on minute inquiry, to have existed several months anterior to the appearance of disease in the chest.

In such instances, then, we are not authorized to infer, from the pulmonary affection being the only urgent symptom, that the disease of the abdominal viscera is an effect of it, *for both may, perhaps, originate in the same generally morbid condition of the system.* Were there no positive evidence that the abdominal derangement preceded the inflammatory affection of the lungs, it is yet extremely probable, that the cause which produced this affection would, also, occasion considerable disorder of the chylopoietic viscera;—such a derangement appears, indeed, almost inevitable. There is, then, great incorrectness in the assertion of Dr. HASTINGS, that “the cause, too, which gave birth to the disease, was obviously one which acted principally on the lungs, and was not at all of a nature to affect the digestive organs.”

It appears, also, equally inaccurate to state,

that the disease of the liver did not influence that of the lungs, because it is scarcely possible for the structure and function of the liver to be greatly modified without exciting both a direct and indirect influence on the respiratory organs, particularly if they are at the same time in a morbid condition ; an influence not, however, arising from any mysterious sympathy existing between these several organs, but from the diseased state of the sanguiferous system.

The pathology of diseases can be determined only by an accurate knowledge of the derangements existing during life, derived from a careful observation of the symptoms developed during the course of the disorder, the number, situation, and nature of which must be ascertained by a minute investigation into the animal system, and by *post mortem* examination, in which the traces of disease are constantly compared with the symptoms which prevailed during life. An accurate acquaintance with the pathology of diseases, intimately connected as this science is with so many difficulties, can be obtained only by him, who, possessing a mind of superior powers, enriched with much acquired knowledge, imbued with

the spirit of philosophy, has a thorough acquaintance with the various departments of Medical Science, and strictly adheres to the inductive method of reasoning in all his investigations.

In these remarks on the errors and imperfections of existing pathological principles, I have chiefly adverted to those which originate in preformed opinions on the seat and nature of diseases, as they illustrate the extensive influence which such opinions exercise upon *post mortem* inquiries:—there are, however, others which cannot justly be attributed to the influence of such opinions, since they principally arise from the unphilosophical method pursued in pathological investigations after death. These investigations are often commenced under circumstances which almost preclude the possibility of the existence of preformed opinions, as in cases in which death has suddenly and unexpectedly occurred, or in which the prevailing symptoms are unusual, or of so complicated a kind, as to admit only of conjectures in regard to their nature and origin.

In such cases, it is often impossible to de-

termine by the structural changes the exact nature of the disease of which the patient died, since it frequently happens, that the traces of disorganization which are detected, are too various for any of them to be regarded as the cause of death: nor are these traces always of sufficient magnitude to account for its occurrence. The pathology of diseases, occurring under such circumstances, will never be understood by minute dissection of the affected organs, since those that appear the most disordered may, perhaps, have had the least influence in accelerating the cause of death. Accurate information on this subject can be derived only from comprehensive physiological principles, and a constant comparison of the traces of disorganization after death with symptoms that were observed during life. Without such comparing process correct pathological views cannot possibly be formed. The following case, will perhaps, in some degree, illustrate the necessity of the pathologist employing this process in order to attain a clear conception of the nature of diseases.

Some years ago, in one of the discussions of the Royal Medical Society of Edinburgh, a professor of midwifery endeavoured to prove

that, in all cases of difficult parturition, succeeded by death, the inflammation of the spinal cord is the cause of it. To corroborate this opinion, he exhibited a spinal cord of a florid appearance taken from a very small bitch that had died in the act of expelling the young.

In answer to some questions that were put to him, he acknowledged, that it was impossible to explain the origin of the inflammation, and the nature of the influence which it exercises on parturition, but he, nevertheless, maintained it to be indisputable, *that the spinal cord is, under such circumstances, invariably inflamed, and still further, that it is the cause of difficult labours.* In opposition, however, to his opinions, I adduced the following arguments, which may perhaps be considered as affording a rational explanation of phenomena which appeared to him to be involved in profound mystery. As all who died of difficult parturition had, according to his statement, an inflamed spinal cord, all who had experienced difficult labour, but did not die, would naturally, I maintained have the spinal cord in a similar condition, and subsequently suffer from inflammation of the spine, *because*

the inflammation and the difficulty of the labour seemed to have a necessary co-existence, but this, however, is by no means a common occurrence. In answer to this objection he stated, that he brought forward facts, and did not pretend to show how far they were supported by any process of reasoning. It is, however, evident that he advanced only opinions of an extremely questionable kind, and very unlike well established facts, though he might dignify them by that name. There was no decisive evidence, I further maintained, that the spinal cord was, in cases of labour that terminate fatally, in a state of inflammation. Its florid appearance was not alone sufficient to prove it, and no other circumstance was brought forward in corroboration of the asserted fact. Having made these objections to his theory, I next proceeded to explain the manner in which such florid appearance might arise without inflammation of the spinal cord : an explanation which I shall here give, as it will illustrate the necessity of an acquaintance with physiological principles in order to account satisfactorily for the production of morbid or unusual effects in the animal system.

The violent pain attendant on difficult labours disturbs the action of the more important organs, in consequence of which, the distribution of the blood is greatly modified. It is, also, evident that the sanguiferous system is disordered by the distended condition of the uterus, as the vessels in the pelvis and abdomen are necessarily subjected by its enlargement to undue pressure, if not, also, otherwise affected. *The spinal cord from its very close connexion with the circulatory system of the internal organs, will participate, more or less, with them in the disturbed condition of the circulation, and will, consequently, be liable to exhibit that florid appearance which the professor regarded as indicative of inflammation.*

These two facts, viz.—the great disturbance in the distribution of the blood in the abdominal viscera, particularly in cases of difficult parturition, and the powerful influence which every such general disturbance necessarily exerts on the vessels of the spinal cord, seem rationally to account for the phenomena in question, as they furnish sufficient causes for the effect produced, without our supposing it to arise from spinal inflammation. With these remarks I shall close this Section on the

proper mode of conducting *post mortem* examinations, so as to lead to the establishment of correct pathological views. There is no necessity for entering here into a more particular statement of the various errors and imperfections in prevailing pathological principles : the few examples of such errors and imperfections already given, having furnished me with an opportunity of pointing out the chief sources of fallacy in investigations into the seat and nature of diseases, and of suggesting the proper mode of avoiding them in future inquiries.

SECT. IV.

How far, and in what way, our knowledge of the operation of the more efficient remedial agents corroborates the preceding views, and leads to the establishment of enlarged and correct practical principles in the Science of Medicine.

REMEDIES are often employed rather from a knowledge of the final effects generally produced by them, than from an accurate acquaintance with the manner in which they influence the vital powers. A knowledge, however, of such effects is not alone sufficient to direct the application of remedies, because no two constitutions are ever found exactly alike, or are similarly influenced by the same disease. The great discrepancy in practice arises from the same beneficial effects being produced by the employment of very different means. One practitioner, perhaps, cures an inflammatory affection by emetics, an-

other by copious bleeding, and a third by severe counter-irritants, and the judgment of each is, therefore, liable to be biassed in favour of the particular remedy, the use of which, in his own practice, he has frequently seen followed by the happiest results. No general practical rules can be laid down without a just and extensive acquaintance with the laws of the system: such an acquaintance is, indeed, absolutely necessary to enable us clearly to perceive the conditions which would suggest the adoption of the best and most efficient plan of treatment.

This requisite information, however, is not generally possessed by the medical profession, as is sufficiently proved by the opposite views they entertain of the same disease, or the same classes of diseases, and the strikingly beneficial effects they state to have resulted from the employment of the different modes of treatment adopted by each of them.

It is not possible to adopt any measures in the treatment of disease, that shall be extensively useful, unless we first ascertain in what manner the vital powers will be either generally or partially influenced by them, but this

knowledge can be attained only by a patient and laborious study of the numerous functions of the body both in a healthy and morbid condition. I have, in a previous portion of this work, dwelt at considerable length on the functions of the sanguiferous system, and the mode in which they are liable to be disturbed by various agents; so that it is here only necessary to glance very slightly at these subjects, in order to show how extensively useful an intimate acquaintance with them will be found in practice.

In all inflammatory diseases the circulation is invigorated, and the properties of the blood are rendered much more stimulating than they are in its natural state. The object of the practitioner is to correct this too highly invigorated state of the sanguiferous system; in doing which recourse may be had to different methods, or to one favourite plan in particular, which has occasionally been found successful. But though opposite means may produce the same effects, they cannot be all equally beneficial; and it is, therefore, highly important, that a judicious selection be made so as to attain the desired object with the greatest possible ease and security. Bleeding,

emetics, purgatives, diaphoretics, internal and external stimulants, have been prescribed by different practitioners in the treatment of the same disease, and, according to their general statements, each mode of treating it has been attended with extraordinary benefit.

It is, however, evident, that these remedies do not act in the same way on the vital powers, although they may be followed by the same obviously good effects; and it is, therefore, necessary to know how they do operate, so that we may employ them only under those circumstances in which they are peculiarly fitted to be of service. Whilst each of these several modes of treatment is separately adopted by one set of practitioners, by others they are employed in conjunction at the same time, or in quick succession.

Though it is not my intention to enter here into a minute consideration of the action of different remedies, (which will be fully investigated in a subsequent part of this Treatise,) it is yet necessary to make a few general remarks on it, as the elucidation of this will tend to strengthen the principles already laid down, and prepare the way for the estab-

ishment of others which have still to be explained.

The abstraction of blood, in cases of inflammation, diminishes the rapidity and vigour of its motion, as well as its too highly vitalised condition : a change which is beneficial, because it allows the organs primarily and secondarily diseased to recover their natural tone and action. As much general fever and excitement always co-exist with severe local inflammation, it is easy to conceive, that every important organ of the body, whatever be its office, when affected with such inflammation, must necessarily be much disordered, and as venesection lessens fever and excitement, the general derangement of the system will be very much corrected by it.

Though it is somewhat difficult to ascertain the exact degree in which the local inflammation is lessened by any general improvement in the condition of the several vital powers, it is yet sufficiently evident that great good results from it. The more abundant and healthy secretions from the chylopoietic viscera may perhaps remove the cause of the inflammation, or of its extreme severity. A

copious flow of perspiration, or a moist state of the general surface of the skin, which frequently succeeds bleeding is beneficial, because it diminishes the undue plethora of the body, and consequently tends to correct certain functional derangements which may have given rise to the local affection, or which may have very much aggravated its violence. Changes of this kind produced in the system by the abstraction of blood subdue inflammation, and the success which attends the employment of it has accordingly been greatly extolled by many who were but slightly acquainted with the real cause of these changes.

It must, however, be acknowledged that, though we can perceive certain general modifications in the vital powers on the abstraction of blood, it is very difficult to determine to which of these modifications in particular, the benefit resulting is to be ascribed. At one time it may arise from the profuse perspiration which often succeeds bleeding, and greatly diminishes the inordinate action of the sanguiferous system ; at another, from the improved condition of the bowels, the various internal secretions being established or rendered more healthy in quality. Both these effects, in-

deed, are, in many instances, produced in conjunction with others that necessarily accompany them. Other remedies subdue inflammation almost as soon as bleeding, and it is, therefore, of great importance to know the effects which each produces in the system, that we may be able to make such a selection and application of them as circumstances require. The benefit produced in the general system by venesection, does not arise from its taking from it any noxious qualities, but solely in consequence of changes which it occasions in the sanguiferous system.

One of the phenomena, most characteristic of inflammation, is the buffy state of the blood, which alone is very often considered a sufficient reason for having recourse to the frequency of the employment of venesection ; the quantity of blood abstracted at one time, being proportionate to the extent of this symptom. Whilst this symptom, indeed, exists, it has been supposed scarcely possible to bleed too frequently or too much ; and hence, in many cases, one bleeding has followed another in rapid succession for no other reason, than this appearance of the vital fluid in conjunction with the continuance of the disease. Whilst the buffy

state of the blood has thus occasioned too free and prolonged a use of venesection, the absence of this symptom, in many diseases, has led the practitioner to conclude that bleeding, so far from being required, would be unquestionably prejudicial. The existence or non-existence of this symptom is certainly no just criterion of the propriety or impropriety of venesection, since it may, at one time, exist when its employment would be detrimental to the system, and, at another, be wanting when bleeding is calculated to be of great service. Since the buffiness of the blood arises, as shown in the "Experimental Inquiry," from the extensive chemical changes which it undergoes in the lungs, the absence of this colour, or an entirely different appearance of it, must be attributed to a less degree of chemical action, and can only be allowed to influence the application of remedial measures, when the causes of its production are clearly known.

A knowledge of these causes, and of the seat and nature of diseases, will satisfactorily explain why different modes of treatment give rise to similar good effects. Inflammation of any part of the body, occurring in an extremely debilitated constitution, may occasion a highly

buffy state of the blood, *merely because it disturbs, to a considerable extent, the functions of the lungs*, in which case the abstraction of a large quantity of blood would perhaps be greatly detrimental. The phenomena of delirium tremens, and the treatment which experience has proved to be beneficial or injurious, afford abundant evidence of the truth of this opinion. Those who are attacked with it have always indulged freely in stimulating liquors, the tendency of which is to destroy the natural tone and energy of the system, exciting, however, for awhile an undue flow of animal spirits, which are liable to be very much depressed by any sudden transition to an opposite line of conduct, and particularly by the employment of depletory measures. Now, bleeding has been almost invariably found prejudicial in the treatment of this disease, though the blood at the time exhibits an extraordinary degree of buffiness.

Professor DUNCAN tried this practice, in many cases, in the Edinburgh Infirmary, and candidly acknowledged, that it was generally followed by fatal results. The observation and experience of others also prove its injurious tendency. *The constant motion of the*

body, the almost incessant talking, and the accelerated circulation,—phenomena characteristic of delirium tremens, cause the mass of blood to pass much more frequently than is natural through the lungs, and hence this fluid acquires a buffy condition proportionate to the extent of the chemical changes induced.

It is then evident that this condition of the blood cannot alone be considered a symptom proper to direct practice, unless the causes of its production be fully ascertained. The aim of the practitioner in the treatment of delirium tremens is unquestionably to diminish the morbid excitement of both mind and body. Bleeding, however, according to the foregoing remarks, is not so well calculated to effect this as direct sedatives, which allay almost immediately the inordinate excitability of the nervous system, and lessen the too violent action of the heart and circulatory apparatus, which is the cause of the extensive chemical changes in the lungs. Were it even supposed that this disease consists in inflammation of any of the membranes of the brain, it will, nevertheless, be aggravated by the circulation of blood, possessed of too highly oxygenated properties, *because it will*

necessarily increase the undue excitement of the cerebral functions.

These few observations shew how important it is justly to appreciate the nature of the influence which a local disease is capable of exercising on itself, and the system generally, by disturbing particularly the sanguiferous functions, as well as to be thoroughly acquainted with the action of the remedies employed in order to treat disease with every possible advantage.

To point out in a striking manner effects which different remedies produce in common, it may be well to consider any single affection, in the treatment of which various plans have been used with success. Bleeding, emetics, purgatives, internal stimulants, diaphoretics, and cold bathing, have at different times, and by different practitioners been employed in the cure of typhoid fever, and occasionally with the happiest results ; but as this disease is never exactly the same, either in its nature or origin in any two cases, it cannot be expected that the same remedies will always be equally beneficial. At one time disorder of the stomach may be the cause of the fever, at ano-

ther, that of the liver or bowels, or perhaps derangement of the functions of the skin, and hence the success of the means employed will, in a great measure, be determined by the seat of the disease, and the nature of its exciting causes.

Having already briefly alluded to the manner in which venesection influences the system, and as I purpose in a subsequent part of this Treatise to consider its operation more in detail, it is not necessary here to make any further remarks upon it. Though it is not possible to point out in few words the various circumstances which ought to regulate the employment of bleeding, it may, however, be stated, that it is serviceable in the treatment of fevers, chiefly on account of diminishing the undue action of the circulatory system generally, or of certain parts of it in particular, which are perhaps the primary seat of the disease, or from equalizing the distribution of the blood. It frequently corrects the disordered actions of the numerous organs of the system, by promoting copious perspiration, which reduces or regulates the temperature of the body, and tends to re-establish the natural secretions of the

chylopoietic viscera,—changes which explain the occasionally sudden cessation of the disease, or the amelioration of its most urgent symptoms. An emetic produces similar modifications in the vital powers. During its operation, the blood is propelled with increased velocity throughout the system, and in consequence undergoes in the lungs extensive chemical changes which do not so directly follow the abstraction of blood, though they quickly succeed its judicious employment. An emetic may also remove morbid secretions and imperfectly digested food from the stomach, but the great benefit derived from its operation in cases of fever, *arises rather from alterations caused in the distribution and properties of the blood, than the rejection of ill-conditioned matters from the stomach.*

Though it will, perhaps, be admitted, that venesection and emetics produce many important effects in common ; one striking difference between them, which cannot be too attentively considered in the treatment of diseases, is, that *one draws from the system a quantity of the circulating fluid, while the other simply modifies its distribution.* Hence great discrimination is required in the employment of the

former remedy, as its injudicious application might be greatly detrimental to the powers of life.

Many imagine that emetics exhaust the vital energies. I have prescribed them on numerous occasions when great debility existed, and in no single instance do I remember to have observed any such consequence.

Fever has often been cured by internal stimulants, but they have been found less efficacious than either of the two foregoing remedies, from their tendency to increase existing inflammatory symptoms. They have, however, in many instances, exercised a beneficial influence, and the cause may perhaps be thus explained. If the disease is not always to be attributed to a manifest irregularity in the distribution of the blood, and a consequent deterioration of its properties, it will scarcely be doubted, that these morbid conditions invariably co-exist with it, and their being frequently removed by a liberal use of internal stimulants, has led to their adoption, and, at times, to an indiscriminate employment of them.

By invigorating the action of the heart and capillaries, they increase the circulation of the blood, which necessarily promotes its more extensive chemical changes in the lungs, and in this way they may produce effects similar to those succeeding the operation of venesection and emetics. Stimulants have been found of considerable advantage in those cases of fever in which the symptoms of typhus rather than those of inflammation prevail ; a fact strongly corroborative of the opinion expressed concerning the existence of congestion, and the accuracy of the view proposed to account for the occasionally beneficial influence of such remedies.

The various and important effects produced in common, by venesection, emetics, and stimulants, might also be shown to arise from diaphoretics, purgatives, cold and warm bathing, but the full investigation of these agents will be pursued in subsequent parts of this Treatise.

Though the several remedies enumerated may, under peculiar circumstances, give rise to the same favourable results, it will, how-

ever, be acknowledged, that they differ very widely in their operation, and consequently a judicious selection and application of them is indispensably necessary, to treat disease with any possible degree of success.

The further consideration of this subject is postponed until the various functions of animal and organic life,—the manner in which they are directly or indirectly associated together in health, and the mode in which the disordered action of one deranges that of others,—have been more minutely examined.

CHAPTER II.

THE INFLUENCE OF CLIMATE, HABITS, AND TEMPERAMENTS ON THE PRODUCTION AND CHARACTER OF DISEASE, AND THE MANNER IN WHICH A KNOWLEDGE OF THIS INFLUENCE OUGHT TO MODIFY THE PRINCIPLES OF TREATMENT.

SECT. I.

The influence of Climate.

THE inquiries and speculations of the medical theorist are generally regarded with perfect indifference by the practical physician. Guided in his mode of treatment by experience alone, he can form but a very inadequate idea of the value of those philosophical investigations, which display, perhaps, no obvious relations to vulgar experience, though they were really suggested to the enlarged and enlightened understanding by the results of such experience, and are conducted on the sound principles established by it. In Medical Science, the practitioner naturally employs the facts with which he becomes acquainted

in support of some speculative principle, which, however, from the limited sphere of his observation, or the narrow powers of his mind, is often of the most indefinite and imperfect kind, being founded on very circumscribed and ill-digested observations: yet, though thus imperfect, this principle exercises a strong bias on his judgment to the great injury of truth and human welfare. The speculations of the philosophic enquirer being of a bolder character and more original in conception than those of the man of mere practical talent, are often very unjustly regarded as the ingenious but idle dreams of imagination. The striking difference, however, between the speculations of the two, consists chiefly in this:—The philosopher, from the collection of a great number of well arranged facts, is enabled to take a wider and juster survey of the phenomena of the animal economy, than the physician, though apparently aided by his purely practical knowledge, and accordingly the views of the former are in range and extent of application so vastly superior to those of the latter, that their very excellence, from not being duly appreciated, is frequently an objection to their adoption. The consideration of subjects which seem remotely related

to the every day routine of practice, generally excites too little interest in the medical profession. Every inquiry, indeed, into the laws of life, and the numerous modifications to which they are subject from the operation of internal and external causes, whether these modifications be permanent or only transitory, is highly important. A knowledge of them is indispensable to the judicious employment of remedies ; for without being accurately acquainted with the vital powers on which we have to operate, we cannot so accurately select the means of recovery, and so justly proportion them to the exigency of the case as to produce the highest possible degree of benefit.

These remarks are made in answer to objections frequently urged against the value of investigations which can, from their nature, admit only of a few established principles : these however, are not, from the smallness of their number, less worthy of study, but, on the contrary, more imperatively demand it, as we cannot too eagerly seek even a little light, where all is involved in total darkness. In the following attempt to ascertain the influence of climate, habits, and temperaments on the production and cha-

racter of disease, opinions will be advanced and speculations offered, which are only slightly supported by undoubted evidence, whose value will, perhaps, consist rather in awakening and directing the mind to fresh investigations, than in furnishing it with any positive knowledge. Subjects of this kind, though so intimately connected with every department of Practical Medicine, have hitherto been studied so partially, or with so little advantage to the progress of this science, that the consideration of them has not led to the establishment of any general physiological principles. Detached thoughts, oblique hints, and a few ill supported opinions, are found in medical writings, but in vain do we endeavour to discover in them a clear and profound insight into the boundless relations of those questions which have a most intimate connexion with the healthy and diseased conditions of the body.

The observation and experience of the practitioner may, in many instances, lead him to act judiciously in the treatment of diseases, but if to these qualifications were added a knowledge of the causes which conduce to his success, his acquired skill would assume

the more imposing character of scientific practice. A knowledge of the influence of climate and habits on the human frame, and the manner in which temperaments predispose the constitution to disease, or modify its character, would necessarily give a degree of certainty and precision to medicine which it does not at present possess. Whence arises the obscurity in which many departments of this science are involved, but from our *ignorance of the natural laws of the system, and the mode in which they are influenced by internal and external causes?* Although physiologists have failed to show clearly what these natural laws are, and how they are liable to be modified, their failure is no argument against the probability, that succeeding labourers in the same field of science will go much farther, because an imperfect acquaintance with these subjects is mainly attributable to the erroneous method which has been hitherto pursued in studying the phenomena of nature: many of whose mysterious operations will, doubtless, be discovered when they are investigated in the true spirit of philosophy.

The influence of climate may be considered in two points of view, 1st, as it tends

to produce those qualities of body and mind which constitute national character; 2ndly, as it occasions disease from local circumstances, such as low and marshy situations, sudden vicissitudes of seasons, or exposure to winds from vicinity to the sea. The investigation of the first class of causes may perhaps be said to belong strictly to the natural philosopher; but though it is peculiarly interesting to him from its extensive relations to almost every department of science, it is, also, of vast importance to the medical practitioner, as it is calculated not only to modify the application of remedies, but, also, to account for many striking discrepancies in the statements of distinguished physicians in various parts of the world, on the degree of success attending the employment of different plans of treatment. If I presume, then, to make a few remarks on the influence of these causes, I trust I shall be pardoned for so doing, particularly as I shall endeavour to restrict them to those points which have a close relation to the improvement of medicine, and even upon these my remarks will be very brief, consisting almost entirely of detached thoughts, thrown out rather for the purpose of exciting inquiry than of establishing a system. Were I to attempt

giving a full description of the manner in which these causes operate, the task would necessarily be very imperfectly performed within the limits allotted to this disquisition; as the proper consideration of each would require more space than it is my intention to devote to them all. Among the causes to which national character, (by which term I would be understood to mean, the distinguishing peculiarities of both mind and body) is principally to be ascribed, are the following :—

- 1st. The productions of the soil.
- 2dly. The temperature of the climate.
- 3rdly. The degree of civilization.
- 4thly. The form of government.
- 5thly. The low or the mountainous character of the country.

It would not be difficult to prove, that some of these causes are the natural effects of others, and cannot, therefore, be justly considered as independent agents, but further simplification would serve no practical purpose: and admitting them all to be true causes, it must still be evident to the most ordinary understanding, that they act and re-act on each other, producing effects as

complex in their nature as the causes themselves, in consequence of which it is impossible to refer every individual effect to its particular cause. Supposing, then, this statement, as to the complexity of causes, to be correct, in tracing their effects, much of the reasoning, which it will be necessary to employ, will not be susceptible of direct evidence.

HUME, in his “Essay on National Character,” endeavours to shew, that the distinguishing peculiarities of any part of mankind arise from moral and not from physical causes : but though it may be true that the more or less industrious habits of nations, the characteristic features in their manners, and the nature of their pursuits may, to a considerable extent, be produced by the former ; the degree in which their muscular powers are developed, and the difference of their temperaments are undoubtedly occasioned chiefly by the latter.

In warm and genial climes, where vegetable nature displays whatever is calculated to delight the eye or gratify the senses, her productions, profuse and almost spontaneous, are peculiarly adapted to the constitution of the

inhabitants of such climes, who, requiring neither strong stimulating drink, nor highly invigorating animal food, are best supported by such mild nourishment as gently exhilarates, or refreshes the system,—nourishment, which is abundantly provided for them in a vast variety of rich and cooling fruits.

In cold and less hospitable latitudes, many of the vegetable productions of the more genial climates do not exist at all; and others, which are common to both, are cultivated with greater difficulty, and are, also, much less luxuriant in their growth: but though sparing in the distribution of vegetable, nature has been lavish in the provisions of animal life to the inhabitants of the more northern regions, in which the vicissitudes of the climate could not be borne by the human frame unless strengthened by invigorating and stimulating food, and defended from the cold by clothing of the warmest description, which have therefore been amply supplied to them, as will be evident from the most superficial examination of the productions of northern latitudes, where animal food and strong liquors are the principal articles of nourishment.

Many of these productions might, perhaps, be raised by culture in other latitudes, but never so abundantly as to afford any ground for supposing that nature has not, in a peculiar and extraordinary manner, adapted the produce of the soil to the necessities of the climate; a fact which is well authenticated, and generally allowed.

As it will not then be doubted, that there is a wide difference in the natural productions of climates of opposite temperature, it is important to inquire in what way, and to what extent this difference affects the animal economy. The inhabitants of northern climates possess greater vigour of constitution and physical power, than those of warm and genial latitudes: and it could not possibly be otherwise. The liberal use of animal food, as well as of the most nourishing and stimulating vegetable productions, exerts a powerfully invigorating influence on the vital energies, much increased by strong muscular exertion, which the natives of southern regions could not make, even if they had the disposition, in consequence of the oppressive heat of the sun. The mode of living and habits of the former give to the human frame an extraordinary

development of its muscular powers; in consequence of which, the body in form and stature displays great beauty united with uncommon strength. The broad shoulders, the expansive chest, and the hardy expression of countenance bespeak the inhabitants of northern and temperate climes. Extreme cold is, however, invariably and necessarily accompanied with extreme wretchedness, because nature, although she provides, in polar regions, appropriate food, adapted to the inhabitants of such inhospitable climes, furnishes but a scanty supply of it, whilst she is, at the same time, not profusely liberal in the distribution of her other gifts. The rays of the sun are, in such climes, too rarely felt to invigorate strongly the growth of animal and vegetable life.

Man requires, indeed, for the full development of his corporeal and mental energies, not only an abundance of substantial food, but the favouring aid of many physical and moral causes, which are either wholly or partially wanting in extreme northern latitudes. If then, where these causes powerfully exert their combined influence, as in England and the more temperate and civilized parts of

Russia, the human frame and constitution receive a peculiar and general character differing widely from that which distinguishes the inhabitants of tropical regions, there can be no doubt, that a proportionate dissimilarity exists in the nature of the prevailing diseases common to these climates, which ought to modify and regulate the mode of treating them.

Strong nourishing food, in conjunction with vigorous exercise, develops to a considerable extent the muscular and sanguiferous systems: the development of the former being, indeed, in some measure, an effect of the latter. The abundance and richness of the blood, arising from vigorous and liberal modes of living, give tone and energy to every part of the system, and render it susceptible of both acute and chronic inflammations: and where this predisposition exists, the temperature of the atmosphere is generally subject to severe vicissitudes, in consequence of which, the distribution of the sanguineous fluid is greatly modified, being, occasionally, transmitted in an undue quantity to some of the internal organs. In this case, the disease produced is liable to be acutely inflammatory from the

combined effects of *the rich and stimulating properties of the blood, and the suddenness and extent of its determination*. Causes which have a tendency to give rise to acute, also frequently produce chronic, inflammations; and it may here be mentioned, in corroboration of this opinion, that, in this country, phthisis or chronic inflammation of the lungs, disease of the liver, and affections which may be traced to the modifying influence of the causes above specified on the distribution of the blood, are extremely prevalent.

In tropical climates the muscular system is delicately formed, whilst the sanguiferous is extremely active, as it must necessarily be, from the powerful influence of heat, but it cannot be considered vigorous, understanding by this term that condition of it which is thus denominated in northern and temperate latitudes, because those causes are, in a great measure, absent, which, in these latitudes, exert an extraordinary influence on the properties and distribution of the blood. The mental and bodily powers of man in warm climates arrive early at maturity, a natural effect of the highly stimulating qualities of the vital fluid, which, though not sufficiently rich, or nourishing, to

produce a full development of the physical energies of the system, are, nevertheless, calculated to excite and strengthen those functions and feelings which constitute the phenomena of puberty. These, it is well known, are chiefly seated in the nervous system, which, in tropical regions, naturally displays, not only greater susceptibility of external and internal impressions, but also, greater activity at a much earlier period of life than in cold or temperate latitudes. The natives are, accordingly, gay, lively, and restless, ever in pursuit of pleasure and ease, or of any objects that gratify the ever varying desires of their inconstant nature.

One of the most striking differences, indeed, between the inhabitants of climates in very opposite latitudes, *consists in the different degree of activity displayed by their nervous systems.* The phenomena of health and disease shew that this activity is much greater in tropical than northern regions. In the former, spasmodic diseases are common, being frequently produced by the slightest punctures, together with many other disorders purely belonging to the nervous system, such as, nymphomania satyriasis, &c. which are as unques-

tionably seated in, or dependent upon, it. The essential difference in the stamina of the human constitution, as it exists in various climates, points out the necessity of a proportionate difference in the mode of treating the same kind of diseases in regions widely opposed in situation ; and, at the same time, also, satisfactorily explains the different degrees of success attending the employment of the same or other remedies in different parts of the world. England and France do not differ half so much in temperature and productions as many other civilized parts of the world, yet the same line of practice is not found equally efficacious in both countries. So different, indeed, is the mode of treatment adopted in them, that our intelligent neighbours accuse us of killing our patients by the activity of the measures we employ for their recovery, or our constant endeavours to do something for their relief ; whilst we, in return, charge them with allowing theirs to die, by leaving the cure to the almost unaided efforts of nature. Without enquiring here, how far the practice of both nations is correct, it can scarcely be doubted, that the experience of ages has taught them certain general principles of treatment, from which no material departure could be made

without being followed by the most baneful consequences. In this country, in the treatment of acute, inflammatory, or other diseases, active measures are often indispensably requisite, and if, in such cases, the more palliative practice of our neighbours were adopted, we might then, perhaps, be justly charged with allowing the sick to die, because their milder mode of treatment would, in many instances, be altogether inadequate to controul the existing disorder. If, on the contrary, our measures were rigorously enforced in France, they would be found much too severe, since the constitution of the natives is generally much less robust than that of our countrymen, and though the disease, for the cure of which they were employed, might be acutely inflammatory in its nature, the difference of the circumstances, it should be recollected, under which it occurred, would not admit of very active depletory measures.

The striking difference that exists between the practice of medicine generally prevailing on the continent, and that commonly adopted in this country, will be evident from a very short statement respecting them. In France, the most usual remedies in fevers and inflam-

matory affections, are the abstraction of a small quantity of blood from the arm, the application of a few leeches, or frequent doses of emetic tartar; or other remedies even of a still more lenient kind than these: in England, on the contrary, in treating the same diseases, large quantities of blood are often taken away, and the most powerful means are employed to produce a rapid and extensive diminution in the mass of the circulating fluid, or to effect important changes in the vital actions of the system.

It must not, however, be supposed that our mode of practice has not, in many instances, been found successful in the hands of our continental neighbours, or that theirs has not occasionally been adopted with advantage by us. Numerous persons may, undoubtedly, be found in both countries, whose constitutions are of such a nature as to be benefited by a plan of treatment widely different from that generally pursued in either; but this occasional deviation from the general line of practice furnishes no objection to the fact previously stated, and the argument founded upon it.

The mode of treating diseases employed by our polished neighbours, is frequently adopted

in England by those who, having witnessed its success abroad, have made too indiscriminate an application of it in this country, which has, unfortunately, proved very prejudicial to its general employment, even on those occasions when it would probably be of great service. This circumstance is much to be regretted, as the outcry against the continental practice is as injurious as unqualified praise would be to the progress of medical science.

The stimulating practice of BROWN has been much more extensively employed on the continent than in this country, and certainly with more favourable results: a fact which affords strong evidence in corroboration of the justness of the previous observations in this chapter on the constitutional differences of nations, and the modifications required by them in the treatment of diseases. The free use of stimulants is occasionally of great benefit in cases of fever, occurring in constitutions of weak or debilitated habits, because it gives tone and energy to the vital powers, by which they are enabled to overcome the morbid influence of such disease. When fever, however, attacks vigorous constitutions, to stimulate is injurious, because it increases

the plethoric condition of the system already too great. Hence the stimulating practice is calculated to be more serviceable in situations in which the human frame is not particularly robust, than in those in which it is, supposing it to be affected in both situations with similar morbid symptoms.

There are few subjects more worthy of study than the differences in the constitutions of nations, viewed only in their relation to medicine. In fact, a knowledge of these differences is indispensable to the establishment of just and enlarged views in this science. The experience and observation of enlightened physicians in various parts of the world, cannot fail to exert a beneficial influence on the daily practice of the profession generally, as they furnish the inquiring mind with many additional facts, which, promoting a more intimate acquaintance with the seat and nature of diseases and the operation of medicinal agents, necessarily lead to the establishment of juster practical principles. Though, in the bodily and mental constitution of the natives of every clime, there are characteristic qualities which require a mode of treatment adapted to the prevailing diseases to which they are pecu-

liarily subject, yet it is clear, that numerous constitutional differences exist, not included in any general definition of national peculiarities, a more perfect acquaintance with which, can alone enable us to adopt a proper and successful treatment of the disorders peculiar to each. Facts derived from various sources, cannot fail to throw light on the nature of diseases, and to suggest the mode best calculated to remove or ameliorate them. Whether the facts be the result of our own experience, or that of others, placed in the same or different circumstances, with regard to climate and its productions, they almost equally concur towards the improvement of medicine, *because they possess relations in common to the same important and interesting field of investigation, the animal economy of man, a knowledge of which implies a thorough acquaintance with all the changes of which it is susceptible.*

To enter into a minute investigation of the various kinds of genius characteristic of different nations, and the causes that produce them, would open a field of speculation too extensive for the limits of this Inquiry, and, in many respects, too slightly connected with the practical bearings of the subject we are

discussing. In order to ascertain with any degree of exactness, the origin of the distinguishing peculiarities of nations, it would be absolutely necessary to examine, with great care and attention, the productions of the soil, the temperature of the climate, the state of civilization, the prevailing form of government, the flat or mountainous character of the country, and numerous other causes, which act and re-act on each other in such an extraordinary and inscrutable manner, that it would perhaps be impossible, even after the most mature consideration, to determine more than the general modifying influence of each in the production of individual or national character.

Besides the general causes enumerated, which impress on nations their distinguishing characteristics of mind and body, there are others invariably co-existing with them, which may be designated local or partial causes. Of this description are low and swampy situations, impure air in filthy and crowded places of abode, peculiar properties of water, and a too free indulgence in spirituous liquors. These various circumstances influence the nature of the prevailing diseases of a country. In extremely low and marshy districts, the inhabi-

tants are liable to intermittent fevers and internal congestions, particularly of the abdominal viscera, and their general appearance is by no means so robust and healthy as that of those residing in more elevated situations.

It cannot for a moment be doubted, that the properties of the atmosphere are materially modified by extensive exhalations from the surface of the earth, and it is, also, equally indisputable, that when its constituent principles are deteriorated, important changes, either of a permanent or transitory nature, are necessarily induced in the animal economy. It is, perhaps, not easy accurately to define the nature of these changes, in consequence of their great diversity. It is, however, not difficult to point out the mode in which a vitiated atmosphere affects the vital powers, or to ascertain generally the character of the morbid conditions produced. The qualities of the blood are more or less rich and invigorating according to the purity of the air inhaled, and the nourishment afforded by the food digested. A deficiency in the qualities of either, immediately produces corresponding effects on the whole system. If the blood possess its natural properties, the numerous powers of life are

maintained in healthy action, if it be deficient in them, these powers languish and exhibit manifest symptoms of derangement. Now in those places where the quality of the air respired is deteriorated from too abundant exhalations, the chemical changes in the lungs are but imperfectly performed, and many indications of disease are in consequence evolved. Intermittent fever and abdominal disorders commonly prevail in marshy situations. The blood when drawn from the arm during the existence of these affections, however slight they may be, supposing there is no evidence of acute inflammation, is much darker in colour than natural, which unequivocally shews that it has not undergone in the respiratory organs its usual modifications.

If such a decided alteration exists in the properties of the blood in the milder cases, what must be the extent of the deviation in the more severe ones ! It is well known to those who have bled in the cold stage of intermittent fever, that the vital fluid is exceedingly black, and flows very feebly from the veins. From facts so striking as these, it is scarcely too much to assert, that the blood abstracted from persons in humble life, even

in apparent health, if living in swampy situations, would not exhibit a naturally florid appearance, especially at those seasons in which the exhalations are most abundant, and arise but slowly from the surface of the earth.

In the higher spheres of society, there are so many circumstances which counteract the depressing influence of a morbid condition of the atmosphere, that the same mode of reasoning would not apply with equal force to those who enjoy the comforts and luxuries of life, and to persons in humble life. A vitiated state of the air inhaled, will, in one class, almost immediately produce great internal congestion and extensive functional derangement; and in the other, scarcely any effect whatever:—*simply because the nourishing and stimulating properties of the circulating fluid, in the one instance, are so feeble that they fail to endow the contractile organs, with energy sufficient to withstand the influence of the depressing agent introduced into the sanguiferous system.* Such a condition of the blood constitutes, in a great measure, a predisposition to intermittent fever, abdominal disorder, and to much general functional derangement. It is chiefly in consequence of the preva-

lence of this condition of the vital fluid, that the more wretched members of society are so liable, under sudden and unhealthy changes in the atmosphere, to fevers of a typhoid description, to diarrhœa and dysentery, and even to Cholera itself. Cholera has, in this town, (Sheffield,) and in all other places where it has prevailed, raged, if not exclusively, at least, with the greatest virulence, in situations in which a deteriorated state of the atmosphere was generated by accumulated filth, stagnant pools of water, or the want of a free circulation of air, or by the conjoint action of these several causes. In further corroboration of the view here laid down, the appalling mortality which has occurred, in some places on the continent of Europe, and still more strikingly in the East and West Indies, may be adduced, to prove the existence of a disordered state of the blood before the breaking out of the disease; for those that were attacked with it, had been, with few exceptions, much exposed to the influence of some of the circumstances named, and lived in a way not calculated to invigorate the animal system, or *to afford blood possessed of properly nourishing and stimulating qualities*. If such were not the difference in the vigour of the vital powers, the ravages of the disease

would be as extensive in one class of society as in another. It is acknowledged by all writers on Cholera, that a predisposition exists in the filthy and wretched, to this malady, and it appears reasonable, to suppose, that this predisposition arises, chiefly, from a deteriorated state of the blood, occasioned by the circumstances alluded to, while every part of the organized system is morbidly affected by the circulation of it. Before any remarks are made on the manner in which a knowledge of these matters ought to modify the treatment of diseases, it may be well to state, as the fact is in direct confirmation of the opinions here expressed, that all the means commonly employed in the cure of intermittent fever tend to improve the properties of the blood, and that they are efficient, in proportion as they promote this result.

The active means are emetics, tonics and bleeding, each of which has its peculiar mode of action, but all tend to invigorate the functions of the circulatory system. The practitioner being thoroughly acquainted with the deteriorated condition of the blood in those who are much exposed to the depressing influence of marshy exhalations, will accord-

ingly be regulated in his treatment of all diseases that may occur under these circumstances, by a knowledge of this important fact. If acutely inflammatory affections appear, they must of course be treated with the ordinary antiphlogistic measures, but these ought to be much less actively employed than they generally are, in situations where the human constitution has not previously been debilitated by any of those causes that diminish the vital properties of the blood. Copious bleeding and strong purgatives would unquestionably tend to arrest the inflammatory action, but by depressing too much the powers of life, other symptoms would arise much more tedious and difficult of cure than the primary affection itself, and by so injudicious a treatment, many patients would be liable to fall victims to an untimely death. My own observations and experience fully corroborate the truth of this opinion. By viewing the inflammatory affection in connexion with the vitiated condition of the blood, *our practice will exhibit a wise economy in the expenditure of this fluid, as the abstraction of an ordinary quantity, under such circumstances, frequently produces very unfavourable results.*

It is not my intention here to lay down the rules of treatment to be pursued in such cases, since the consideration of them is foreign to the object of this inquiry. If, however, it were the place to study them in detail, it would be easy to shew, that the line of practice pursued in southern climates, in the cure of inflammatory diseases, occurring in constitutions debilitated by impure air, or by food either deficient in quantity or of inferior quality, is much more likely to be successful than that generally adopted in this country.

These observations, on the treatment of inflammations, may, with equal force, be applied to all other affections appearing under the same circumstances ; because, whatever be their nature, they can only be judiciously treated by the practitioner acquainted with the general and particular effects produced in the system by any of the causes enumerated.

In the *lower classes of society*, diseases of a typhoid description, are extremely common, and, as previously stated, the frequency of their occurrence is almost altogether attributable to the naturally impoverished quality of

the blood. The strikingly typhoid symptoms which they exhibit, are not so generally preceded by inflammatory indications as those occurring in the same diseases in the higher spheres of society ; and experience has fully proved to the observing and intelligent mind, that, in the former case, invigorating measures are imperatively called for, in consequence of the vital powers possessing *little* tone and energy to resist the depressing agency of the disease.

Incalculable mischief arises, in daily practice, from the profession not keeping constantly and steadily in view the constitutional peculiarities of persons occupying very different stations in society, and influenced by very different circumstances. Many of the diseases of the more wretched and destitute of mankind are aggravated or rendered altogether incurable, by the too active means employed in the treatment of them. Venesection is, perhaps, vigorously enforced where a few leeches, or a blister ought to be applied, or strong purgatives are given where the mildest aperients are alone necessary. The existing symptoms, regarding them in a detached point of view, may probably appear to demand

bold and decisive measures, but if they are considered in conjunction with the naturally impoverished condition of the system, it will, at once, be evident, that serious consequences will be liable to arise, where the practice is not strictly regulated by a knowledge of this important fact.

These remarks can scarcely be considered a digression from the subject of marshy exhalations, as they have the closest possible reference to modifications produced in the properties of the circulating fluid, and the functions of the vital powers by an impure atmosphere. The morbid effects which this occasions in a crowded and filthy part of a city, are very unlike those to which it gives rise in low and swampy situations, which will be explained in taking into consideration the differences in the habits of persons so widely opposed in circumstances. In the one case, the mode of living is that which belongs to the country, and the habits are those of sobriety and exercise cherished by agricultural pursuits; in the other, it is that which characterises the lower orders in densely populated places, on the whole less substantially nourishing than the former, and the habits are

much more sedentary, irregular, and dissipated than those of the peasant.

The unhealthy condition of the local atmosphere in one instance, is caused by extremely heterogeneous matters, resulting from accumulated filth of every description ; in the other, its impurities originate entirely in too abundant exhalations from low and swampy ground, and, consequently, there must be a material difference in the nature of these two atmospheres.

These facts, it will perhaps be admitted, are amply sufficient to account for the dissimilarity observed in the character of the morbid effects produced under these circumstances, by a vitiated state of the air. In every country there are local situations where certain diseases are stated very much to prevail, as bronchocele and idiotcy, and which have generally been considered by medical writers, to arise, in a great measure, from the peculiar properties of the water used by the inhabitants for the common purposes of life. Too much importance has, perhaps, been attached to this cause. Where these diseases predominate, many circumstances exist which have a ten-

dency to affect, particularly, the glandular system, the diseases of which, even in towns, are the most common in the inferior classes of society, chiefly in consequence of defective nourishment; and when they occur in the higher spheres of life, the animal system still presents a pale or unhealthy appearance, indicative of great weakness in the vital powers.

Where bronchocele is prevalent, as on the Alps, and in the mountainous districts of Derbyshire, the inhabitants do not enjoy a regular supply of animal food, which is alone fitted to invigorate strongly the constitution, so as to enable it to bear, with impunity, the cold bleak winds and the sudden vicissitudes of the atmosphere peculiar to such situations. It is then, perhaps, most philosophical to conclude, that the frequent occurrence of glandular affections in these places, arises from the operation of several causes, such as an impoverished mode of living, both with respect to the degree of nourishment afforded by it, and to many other qualities common to it; from the influence of hereditary disease, which must be exerted here to a great extent, as the isolated position of the natives necessarily leads to intermarriages and alliances unfavourable to the production of

a healthy progeny, and, lastly, from the conditions of the local atmosphere, which, in the less congenial seasons of the year, cannot fail to act prejudicially on constitutions greatly deficient in tone and vigour.

In alluding to the diseases of northern climates, it was observed, that the liver is frequently disordered, and this is often the case in tropical regions also, arising, however, from different causes. Here, the great and oppressive heat of the sun inordinately excites the powers of the system, and stimulates particularly the liver, producing in it disease, or giving it a predisposition to become seriously affected when the regularity of its functions is in any manner disturbed. It is well known, that persons who indulge to excess in spirituous liquors, are liable to have this important viscus greatly deranged, and this is, perhaps, in part attributable to the stimulating effects produced in the system generally, in which the liver participates only like every other organ, so that its structural changes, occasioned by such a habit, or by solar heat, may be traced to causes, which are much more closely related in the mode of their operation, than might be imagined from the great difference in the na-

ture of them. When both these causes act at the same time on the vital powers, diseases of the liver and the rest of the abdominal viscera, frequently occur, as we perceive in our countrymen, who have resided some years in hot and sultry climates, where they seldom strictly conform to the sober and temperate habits of the natives.

With these few and imperfect observations, I shall close the inquiry concerning the influence of climate. A more profound and satisfactory investigation of the subject, would lead to the discussion of questions which, though highly interesting and important, are only remotely connected with the general physiological principles here developed. In the pages immediately following, several physical causes, which have already been slightly considered by us, will be more minutely examined, for the purpose of placing these principles on a surer foundation, and of pointing out their application to the discovery and the elucidation of the seat and nature of diseases, and to the suggestion of remedial measures of great practical value.

SECT. II.

The Influence of Habits.

THE animal system admits of numerous modifications both of a permanent and transitory kind, which can be discovered only by a patient investigation of the circumstances that produce them. These are generally so closely combined that it is not easy to separate one from the rest, for the purpose of ascertaining, by an individual examination of each, the exact degree of influence which they singly or collectively exert, but the attempt to attain such knowledge, however difficult, can scarcely fail to be attended with considerable success. In these physiological investigations, the same facts and arguments will necessarily be often repeated, to develop and illustrate physiological principles, which cannot be clearly explained or understood, without a continual reference to certain morbid changes in the system, which are diversified in appearance, only by the

function and situation of the organ disordered or the degree of its derangement ; but, notwithstanding this occasional and unavoidable repetition, a sufficient variety will, I trust, be found in my observations, and in the application of them, to interest the enquiring mind, and to promote the object of all discussions of this kind,—the elucidation of many important subjects, which are, from their nature, involved in much obscurity.

The habits and pursuits of mankind in different stations of life, and the conditions of the animal economy, modified by the influence of those stations, produce diseases of a particular kind, or a more or less vigorous state of the vital powers, which must be accurately known in order effectually to counteract, remove, or ameliorate, the sufferings of mankind. Generous living has one common tendency—to invigorate the constitution. It endows the system with great energy, by promoting the formation of nourishing chyle, as well as rich and stimulating arterial blood. Persons who are so favourably circumstanced as to be able to indulge in such a mode of living, are liable to acute inflammations, to apoplexy, enlargement and thickening of the parietes of the heart, and

ossification of the valves of this organ, and of the arteries generally.

Acute inflammation arises chiefly from two circumstances: *viz. the naturally excited state of the whole animal system, produced by the qualities of the blood, and the too stimulating properties of this fluid.*

When blood is transmitted, either by external or internal agents, in too great quantity to any particular organ, acute inflammation is liable to be produced by the strong re-action succeeding the determination of it—a re-action attributable to the disturbance of the capillaries, which are possessed of great excitability, and are supplied with blood calculated to increase it when the functions of these vessels are disordered. It is difficult to convey a clear idea of what is meant by re-action, in the sense in which it is here employed. We know, however, that by using friction on any part of the body, for a considerable time, we produce inflammation. Now, in this case the capillaries directly affected receive more blood than usual, or, in other words, the natural relations, existing between these vessels and the circulating fluid, are dis-

turbed, and this disturbance causes a reaction between them, from which arise the phenomena of inflammation.

The conditions of the capillaries thus affected are, perhaps, similar to those produced by an undue determination of blood in any other manner. It is not, however, so important to determine *how* these vessels are circumstanced in inflammation, as in what way a generous mode of living predisposes the system to its attacks, and how a knowledge of the fact ought to direct the treatment of it.

It is scarcely necessary to say a word on the practice proper to be pursued in such cases, as it is evident, that this must be active and prompt, and of a kind that quickly diminishes the mass of the circulating fluid. It may, however, be well to observe, that when the acute symptoms have, in a great measure subsided, tonics and slight stimulants may with propriety be employed : they have been too generally avoided in this stage of the disease, from a fear of reproducing inflammation, though much mischief has occasionally arisen from the neglect of them. The vital powers, exceedingly reduced by the

severe measures adopted in cases of acute inflammation, have frequently not sufficient energy to overcome the morbid condition of the system still remaining, after the removal of the inflammation, in consequence of which, typhoid symptoms, accompanied with great debility, make their appearance, and long continue to render the recovery of the patient extremely precarious.

The natural vigour of the constitution should be kept in mind, in order to enable us properly to regulate, not only the application of active depletory measures, but, also, the subsequent treatment. When we have subdued the acute symptoms, we should endeavour to re-establish the healthy functions of the system, which will generally be best done by the remedies recommended above, as they tend gradually to strengthen and stimulate the enfeebled energies of the constitution. The fear of exciting inflammation by the employment of them, is not well founded.

Generous living, accompanied by dissipation of various kinds, demands a proportionate modification in the treatment of inflammatory diseases, as it frequently oc-

casions changes of structure, or manifest functional derangement, in consequence of which the system, though it may appear vigorous, will not bear very active depletory measures. To abstract a large quantity of blood, and at the same time, to act powerfully on the bowels, may, perhaps, control the inflammatory affection, but will be extremely liable to cause great nervous irritability, or typhoid symptoms, more difficult and tedious of cure than the primary disease itself. The vigour of the constitution is rather apparent than real, factitious than naturally inherent; and we cannot, therefore, use too much caution, in diminishing it by the employment of means which greatly reduce the mass of the vital fluid. This may, occasionally, be done with benefit; but, as a general rule, it will be found most safe and efficacious to restore as far as possible, the natural distribution of the blood *by the application of remedies which, without materially diminishing the mass of this fluid, simply modify its circulation.*

Typhoid diseases, when they attack persons of dissipated habits, require also to be treated with great circumspection. The inflammatory symptoms which precede or accom-

pany them, must not be repressed by a vigorous employment of the lancet, or frequent exhibition of purgatives; since both will be apt to destroy the tone and energy of the system, which it ought to be our particular study to economize :—an object which will be best effected by the employment of mild depletory measures, if such be at all requisite, in conjunction with gentle tonics and stimulants. In cases of this kind, the latter remedies are exceedingly valuable when used with that care which a knowledge of the origin and nature of typhoid diseases, and of the condition of the constitution, cannot fail to dictate. The practitioner ought to keep in mind, during the whole period of his treatment of the disease, the dissipated habits of the individual, and carefully avoid being induced, by the apparent vigour of the system, to have recourse to very active measures. Persons of regular, but rather abstemious habits, or those whom necessity compels to live on scanty fare; are much less liable to morbid affections of all kinds than either of the two foregoing classes, and the diseases by which they are attacked, are comparatively easy of cure. The constitutions of such persons will bear more active treatment than might, perhaps, be ima-

gined from their sober and temperate mode of living,—a circumstance, however, for which it is not difficult to account.

It is an acknowledged fact, that the body does not require so great a quantity of nourishing food as it generally daily receives to maintain it in health and vigour, and those individuals, therefore, who live rather abstemiously probably take enough to satisfy the necessities of nature. The various organs of the system indeed are not liable to be repeatedly and permanently disordered by temperate habits, so that when any of them, in persons of such habits, are affected with inflammation, more active means may be employed to remove it, than in those cases in which a previously debilitated state of the constitution had been caused by sensual excesses.

The practitioner, however, is very apt to err, in the treatment of many diseases occurring in persons of sober habits, by endeavouring to do too much. If very urgent symptoms do not exist, the almost unaided efforts of nature are generally sufficient to re-establish the ordinary functions of the vital powers, and even when they are not, only the mildest

remedies are commonly required. The truth of these remarks might easily be established, by stating the particular circumstances which shew the propriety of not interfering at all, or only slightly, with the efforts of nature : but a detailed statement of such circumstances, would lead us very far from the general outline of this inquiry, the object of which is not to prove, by multifarious and undoubted evidence, the validity of every opinion advanced or the correctness of every fact stated, but merely to adduce such evidence and reasoning as may appear necessary to corroborate or establish a few very important and practical principles.

Sedentary pursuits have a tendency to enfeeble the circulation, and lead to the deterioration of the properties of the blood, but some more than others, from the constrained position which they impose upon the body, or the close and incessant mental application which they require ; all, however, producing disorder proportionate to their intensity, though similar in their nature. However apparently unlike in the mode of their production, character, or symptoms, the diseases thus produced ; and however different the manner

in which they are treated may be, they may all be traced to the same fruitful source—derangement of the sanguiferous system, and the same practical measures may be shown to be, in most instances, more or less applicable to all of them.

Diseases in females, arising from too sedentary habits, are much more diversified and severe in their nature than those produced by the same causes in men. The animal system of the former is more delicate and complex in its structure, as well as possessed of a higher degree of susceptibility, than that of the latter; hence, the derangement of one organ more readily disturbs another, which in its turn affects a third, till the whole frame becomes gradually involved in disease. The uterine functions of the female are easily and frequently deranged by causes that would be followed by no serious or permanent effects, if these functions were not implicated in the mischief induced; but as they frequently are, we ought not to be surprised at the variety of the symptoms which appear, or the difficulty of their cure. The remedies employed in such cases, may, perhaps, for a short time, remove a few of the more urgent pains or disagree-

able sensations indicative of the disorder of the stomach, lungs, or brain ; but if, in consequence of this apparent improvement, the farther application of them be discontinued, before the uterine functions are perfectly restored, the restoration of the patient to health will generally be extremely tedious, and will seldom be fully accomplished without the occasional assistance of art.

In considering the various diseases unquestionably caused by sedentary habits, the peculiarities of the female, then, must not be lost sight of, as they tend to explain the occurrence of many morbid phenomena, that would otherwise be inexplicable. A knowledge of these peculiarities and of their influence on the system, is, indeed, indispensably requisite to account for the variety and inveteracy of many disorders of the animal system as well as the inutility, or inefficiency of the remedies generally employed in the treatment of them.

Many circumstances, directly or indirectly connected with sedentary habits, concur in giving rise to general derangement of the system, all of which must be duly pointed out in order to afford a satisfactory explan-

ation of the numerous morbid effects occasionally produced by them. One of these is the constrained position of the body, which tends very much to enfeeble the energies of the vital powers, by preventing the free and frequent expansion of the chest, without which the blood cannot properly circulate through the lungs, and will not, therefore, undergo in these organs its ordinary chemical changes.

It does not, however, follow from this fact, that the vital fluid, though its properties are thus considerably deteriorated, will be at once altogether unfit for carrying on the operations of life, since that extremely diseased condition of the blood, which would completely incapacitate it for the performance of its various offices, is, in many instances, wholly or partially counteracted by the occasional influence of highly exhilarating amusements, or other exciting causes, such as violent exercise, stimulating drink, and pleasurable emotions.

In those cases in which these causes exert a very limited power, diseases are frequently produced in consequence of the sanguiferous

system being too much disordered to meet the necessities of the animal economy ; but in the greater number of those persons whose habits are most decidedly sedentary, the severity of such diseases is frequently lessened by the grateful influence of some of the exciting causes just mentioned. This influence is most frequently experienced by the lower orders, amongst whom it is also most required. A day of recreation is to them a day of festivity ; it withdraws them entirely from their ordinary avocations, and is generally spent in the pursuit of pleasures, not necessary to be here particularised, which are always calculated to rouse the vital energies, and, therefore, well adapted to correct the properties of blood which has been deteriorated by too close confinement.

Persons of this class are not susceptible of the higher enjoyment which arises from intellectual studies, or the interchange of social feelings elevated by correct moral sensibility, and dignified by refined taste. They love what gratifies the senses, or the appetite, such as the stimulating draught, the convivial party, and the sports and amusements which exhilarate the mind or excite the body. The beneficial

influence of these various indulgences and gratifications is very great, as will be most evident from observing the pernicious and often fatal effects of sedentary habits on the constitution in the absence of all such indulgences and gratifications. These mournful effects are most strikingly apparent in females, whom necessity confines to close application of both mind and body, without allowing sufficient rest and recreation to renovate the exhausted powers of the system. In those situations of life, in which constant application and confinement are required, the frequent disorder of some one, or of the whole of the chylipoietic viscera, traces the cause of the existing symptoms, to the unhealthy condition of the blood and its irregular distribution—whilst at the same time, it suggests the means best calculated to remove them. Morbid effects of a similar kind, are often observed, also in persons of naturally retired and sedentary habits, devoted to intellectual pursuits, the successful cultivation of which, whilst it demands the closest possible attention of the understanding, is generally accompanied with a proportionate inactivity of body. Persons of this description are, however, in many respects, more favourably circumstanced

for the possession of health, than those who are confined by more humble occupations. Their living is commonly more generous, and the air which they habitually breathe less vitiated than that inhaled in crowded rooms, or ill ventilated places; and they have opportunities of deriving health and vigour from occasional excursions of pleasure, in which the labouring classes of society cannot indulge. It is, however, extremely probable, that these apparent advantages are more than counterbalanced by the rough and active sports, the more buoyant spirits, and the keener appetite of those who toil to maintain existence. An unnatural position of the body is not the only circumstance connected with sedentary habits which tend to produce disease, or a predisposition to it : pernicious consequences of a similar kind will arise from a merely inactive state of the body, independent of any particular position, though the conjoint operation of both is, of course, more injurious than that of either separately.

To secure vigorous health it is not only necessary to refrain from doing what is decidedly detrimental, but also absolutely requisite to do that which experience proves to be unques-

tionably beneficial. To forego placing the body in an unnatural position is only a negative circumstance, not at all exciting the vital powers, or diffusing life and energy throughout the system: for these are effects, which properly-regulated exercise and temperate habits can alone produce. The blood cannot undergo, in the lungs, its ordinary chemical changes, nor be duly circulated, unless exercise be frequently taken in the open air, and, in such a way, as to stimulate the functions of life. It may perhaps be thought that too great stress is here laid on the importance of the blood being properly oxygenated and distributed, since other modifications, occurring in the general system, may appear equally essential to health, such as regular evacuations from the bowels, and the natural flow of cutaneous perspirations, which may, probably, be imagined to arise as directly from exercise as the changes in the properties of the blood, and may, accordingly be regarded as somewhat independent of them. As all secretions, however, are derived from the blood, and are always modified by alterations in it, it can scarcely be doubted, that the benefit conferred by exercise is chiefly attributable to the improvement produced by it in the functions of the sanguifer-

ous system. Were this the proper place for considering the subject in detail, it would be easy to adduce ample evidence in corroboration of this opinion. Impure air is frequently another cause to be taken into account, in endeavouring to ascertain the different injurious circumstances attendant on sedentary habits. The greater part of those, on whom necessity imposes such habits, generally live in crowded rooms or ill ventilated situations, where the atmosphere is not sufficiently pure to invigorate the constitution. Were its properties only slightly deteriorated in such places, it would yet be an important cause to be taken into consideration, in conjunction with an unnatural position of the body or its inactivity, in explaining the origin of many serious modifications observed in the animal system under the circumstances previously specified.

After these few general remarks on the influence of sedentary habits, it is necessary to describe more minutely certain morbid effects produced by them. We have, hitherto, alluded only to the deteriorated properties of the blood and its irregular distribution. Many

other phenomena co-existing with, and dependent upon them, remain to be pointed out and briefly considered.

Derangement of the stomach and bowels is the most common accompaniment of sedentary habits. The appetite is perhaps fastidious and delicate, or the food which is taken causes flatulence, or a disagreeable sensation in the stomach. The sensation, when not acutely painful, is rather of a gnawing character, or is perhaps more frequently attended with a feeling of distention, which occasions much general uneasiness. Great sensibility is often evinced on pressure being made over the epigastric region. The bowels are generally constipated, though at times they are quite the reverse. There are sometimes daily evacuations, which from the regularity of their occurrence, lead one to suppose that the functions of these organs are pretty accurately performed. In this opinion we are liable to be much mistaken, the evacuations being often small in quantity and unnatural in appearance; and rarely, if ever, of that free, copious, and well assimilated kind observed in a vigorous state of the constitution, and

which is accompanied with a feeling of satisfaction or pleasure, that gives the assurance of perfect health for the day.

The symptoms enumerated frequently exist, with greater or less severity, for a considerable period before any medical aid is sought. At this time they have assumed a more aggravated form, and others appear of the most diversified nature. The patient now complains of acute pain in the head, chest, or abdomen, or perhaps in all of them. There is cough or difficulty of breathing on slight exertion, palpitation of the heart or a fluttering of it, as it is sometimes feelingly described. The tongue is thickly furred; there is no longer any natural taste in the mouth; the surface of the body is jaundiced or pale in appearance; the spirits are depressed; and many other morbid indications are present, clearly shewing that the whole of the system is affected, though in different degrees. A detail of all the existing symptoms is not necessary for the just appreciation of the physiological principles which may be here developed and illustrated.

The important and interesting subject of investigation, *is the cause and the nature of the*

general derangement. Sedentary habits, as before remarked, enfeeble the circulation, and lead to the deterioration of the blood. These modifications of the sanguiferous system are capable of producing disorder of the whole body, as they must necessarily be communicated to every part of it, though it does not by any means follow from this, that its numerous organs will be equally affected. This cannot be, as they are not the same in structure, function, or situation, conditions which will cause a material difference in the degree of their derangement.

In those cases, however, in which the derangement is general, every part of the animal system, whatever be the nature of its office, is affected by these modifications. All the operations of life, whether those of secretion, absorption, assimilation, motion or thought, are perhaps performed by means of the capillaries, and as these vessels are necessarily implicated in all the important changes in the sanguiferous system, it is not extraordinary, that the brain and the various organs of the chest and abdomen should exhibit symptoms of disease, when the properties and the distribution of the blood are disordered. The

nature of the morbid changes varies according to their continuance and degree. If they have existed only for a short time, the disease is simple congestion; if for several months, it is, perhaps, simple congestion in conjunction with the first stage of chronic inflammation, or if they have continued for a much longer period, there is frequently a combination of congestion, and of chronic and acute inflammation.

These different diseases are often observed in persons of sedentary habits. How commonly such complain of affections of the head, chest, or abdomen! They have frequent head-aches, occasional or constant cough, indigestion or derangement of the liver or bowels. If the subjects of these symptoms are females, the uterine functions are almost certain to be more or less disturbed; occasionally the catamenia are entirely arrested, or flow so slightly as to be altogether insufficient to effect the important purposes of nature.

Were it the object of this inquiry to point out the numerous diseases which spring, directly, from the morbid condition of the capil-

laries just alluded to, or which are, indeed, intimately connected with them, much light might, perhaps, be thrown upon the origin and nature of many affections, hitherto but imperfectly understood, and modes of treatment might be laid down that would be found more efficient than those generally adopted. The practice would be regulated not only by the existing symptoms of the disease, but by a knowledge of the operation of various morbid causes that may have led to its development or aggravated its severity—knowledge, with which, the writers of most of the popular and justly admired medical productions of the day exhibit, in many instances, no very extensive acquaintance.

Though many of the worst consequences of sedentary habits have already been adverted to, there are conditions of the animal system induced by them, that cannot be considered as amounting to disease, but which must be accurately known, and constantly kept in mind in the application of remedies. There is indeed a deficiency of tone and energy of constitution, which will not admit of very active depletory measures in the treatment of inflammations or diseases in which they are usually employed.

Local inflammations frequently occur in persons of these habits, and though they may occasionally appear to demand the abstraction of a large quantity of blood from the arm, in consequence of the apparent urgency of the symptoms, it will be generally found, that such practice is not often imperatively required. Topical applications, and the employment of means that tend to equalize the distribution of the blood, or gradually diminish its mass, by promoting perspiration, and the secretions of the bowels, will be most generally applicable and salutary. Whatever be the nature of the diseases the habits of the patient and a knowledge of their influence, are subjects which the practitioner ought particularly to investigate.

The nervous system of persons of sedentary habits is very frequently disordered. An unexpected occurrence or a slight surprise, will frequently produce palpitation of the heart, irregular breathing, agitation of the whole body, paleness, and sometimes, even fainting. These symptoms are occasionally so severe, that the practitioner is apt to suppose that structural disease of the lungs, the heart, or some other organ has taken place; nor

is this at all extraordinary, when blood of morbid quality, the tendency of which is to disturb all the vital actions of the animal system, has long been in circulation.

I have rarely observed permanently good effects succeed the abstraction of blood from the arm on these occasions, though the urgency of certain symptoms, such as acute pain in the head or chest, may, perhaps, seem to demand it. Slight relief is sometimes afforded by the measure, but it is indeed too often only temporary. The treatment which is decidedly most beneficial is that which equalizes the distribution of the blood and gradually improves its properties, without directly diminishing its mass. These objects are best accomplished by occasional emetics, blisters, the warm-bath, gentle exercise, cheerful society, attention to diet, and aperient medicines. Emetics are, however, the most valuable of these remedies when there is no evidence of the existence of acute inflammation.

Persons of sedentary habits have the muscular system very slightly developed. They are generally spare of flesh, or, if otherwise, the robust appearance is caused less by the swel-

ling out of the muscles than by an undue accretion of fat. The muscles, when examined, are found flabby, and are rarely capable of undergoing much fatigue or exerting much power. Such appearances are perhaps less frequently observed among the lower classes of society than those, whose appetite is amply supplied or luxuriously pampered with substantial or rich food.

It must, however, be acknowledged, that if the constitution shews a tendency to the deposition of fat, it will occur in every situation of life, and under circumstances apparently the most adverse to its production. This condition of the body often misleads the practitioner, causing him to employ more active depletory measures in the treatment of inflammatory diseases, than are justly required.

Experience and observation have taught me the propriety of abstracting blood with the greatest possible care on these occasions, as the vigour of the constitution is often rather apparent than real. The practice will, indeed, readily reduce the excited action of the

circulatory system ; but it not unfrequently happens, that in so doing the natural energy of the vital powers subsequently declines, and all our exertions to re-establish it, prove ineffectual.

There is another subject connected with sedentary habits, which we have scarcely glanced at, viz. the manner in which intellectual pursuits affect the nervous system.—It has already been shewn in what way they disorder the properties and circulation of the blood, but not how they directly act on the brain, the seat of sensation and thought. It is common to speak of the exhaustion of the nervous principle or fluid, in cases of mental application, but it is questionable whether just ideas are entertained on this matter. We are as ignorant of the mode in which nervous influence contributes to the process of thought, as we are of the manner in which it promotes digestion or secretion, and, hence it is purely an assumption to assert that this influence is expended in intellectual operations. The notion has perhaps been adopted from the consideration that many vital actions are generally allowed to be performed by nervous influence, or in other words, at the expense of

it, such as digestion and secretion, but these are proved in the "Experimental Inquiry," to be dependent on the blood; for they are shown to be more or less efficiently accomplished, according to the properties and distribution of this fluid.

The same kind of evidence may be adduced to shew, that mental operations are equally dependent on the same causes. Fatigue of mind succeeding close application to intellectual pursuits, can be advanced with as little force of reasoning in corroboration of nervous influence and its constant expenditure, in the process of thought, as loss of appetite or sudden depression of spirits. The latter phenomenon has been explained in the work just alluded to, on the principle of important modifications of the properties and circulation of the blood; and, the former may with equal propriety be concluded to originate in the same manner, as similar modifications can be pointed out co-existing with it. Intense application of the mind is necessarily accompanied with an inactive state of the body and impeded action of the respiratory apparatus, and hence it is

clear, that its long continuance will be injurious, because it will prevent the usual chemical changes, or the proper distribution of the blood, in the disturbance of which, the whole animal economy, and not the brain alone, is more or less involved, though it may appear so from the greater susceptibility of its functions and the facility with which such symptoms of derangement as fatigue, weariness, and pain are detected. Cheerful conversation, or exercise for a short time, or light and amusing reading, quickly renovates the tone and energy of mind enfeebled by study; and this may be supposed to arise from the improved circulation of blood in the brain, whereby the functions of this organ are more correctly performed, and it may, perhaps, therefore be contended, that this improvement affords the nervous principle in greater abundance, and thus invigorates the mental faculties. It is not possible to determine this question, nor is it in our power to shew the relations existing between the quantity or the quality of the nervous influence and the energy of the cerebral functions, because we can have no idea whatever of the nature of this influence or its mode of operation.

According to the view here proposed, there is less difficulty in pointing out generally the relations between the conditions of the sanguiferous system and the energy of the cerebral functions ; and the knowledge which an understanding of these relations confers, may be applied to many practical purposes of great importance.

Mental application, from being accompanied by a position of the body unfavourable to the return of blood from the head, may, perhaps, produce congestion of the brain, which is, of course, removed by exercise and cheerful amusements. It will not, however, be doubted, that this application, when severe, affects the properties and circulation of the blood in the manner supposed, and that these modifications are principally the cause of the apparent exhaustion of the nervous energy succeeding intense intellectual operations. As it is my intention on some other occasion to treat this subject more at length, I shall here postpone its further consideration.

SECT. III.

The Influence of Temperaments.

ALTHOUGH no two constitutions are precisely alike in their degree of vital action and mental energy, the more striking peculiarities of them may be generally classified. This can be but imperfectly performed in the present state of physiological science, as our knowledge of many causes and effects in the animal economy, is extremely limited. It may, perhaps, be stated that the few definitions laid down, of the more remarkable phenomena of life, will include many that do not bear much resemblance to each other. This objection applies with almost equal force, to the general classifications in every department of science. The more clearly defined boundaries by which some of them are marked, arise, perhaps, less from an accurate acquaintance with the phenomena examined, than from a minute classification of them. If the more striking pheno-

mena of the system were divided into twenty classes instead of five, it would be in our power to combine under one head, a few much more alike in character, than if many were associated together in the same description.

It would not, however, follow from this plan, that a higher degree of practical knowledge would be conferred; for such a procedure would be liable to divide the attention of the mind, instead of concentrating its energies on a few important points, which ought to be strongly seized and constantly kept in view. It is not my intention to examine, in this section, the numerous prevailing theories on temperaments. To expose their defects or exhibit their excellencies, would require much time and labour, and an elaborate consideration of them would lead to a wide departure from the broad practical outline of the physiological principles discussed in this Treatise.

The names given to the temperaments is a matter of trifling importance, provided we have an accurate conception of the peculiarities designated by each; and the terms commonly employed will, therefore, be retained

in these pages. By a sanguine temperament is generally understood, a vigorous condition of the vital powers. The capacity of the chest being large, facilitates extensive chemical changes in the lungs, and the blood possesses highly oxygenated properties. A considerable portion of animal heat is generated, and abundantly distributed throughout the body, endowing it with the power of resisting, with comparative ease, the depressing influence of cold. The dependence of the various functions of life on the circulating fluid has been illustrated in the "Experimental Inquiry," and it is, therefore, scarcely necessary to make any additional remarks on this point. It may, however, be briefly alluded to in this place, as the thorough understanding of it is essential to the proper estimation of opinions that may be here advanced and strongly enforced. The properly oxygenated blood invigorates the functions of digestion, in consequence of which, food quickly undergoes, in the stomach and smaller intestines, its requisite changes, and a large quantity of nutriment continually enriches the vital fluid. It is hence evident, that this is well calculated to nourish and stimulate every part of the animal system, and we accordingly ob-

serve that the various powers of life are energetically performed. The appearance of the body, but particularly that of the countenance, is frequently florid ; the pulse strong and full, the appetite keen, the secretions of the bowels regular, the muscles well developed, and the body shews a tendency to become rather corpulent, indeed in some instances decidedly so ; the animal spirits are generally light and lively, and the individual is inclined to indulge in sensual gratifications.

This description of the sanguine temperament admits of many modifications. In one constitution in which we have the enlarged capacity of the lungs, there is a superior development of the intellectual faculties, the influence of which is felt in diminishing the desire for frequent participation in sensual pleasures, and leading to the cultivation of pursuits of a contemplative or sober character ; so that the vital powers may, in such instances, be in a less highly invigorated condition than where the mind imposes no such restraints. We may, indeed, suppose less capacious pulmonary organs accompanied with a gay and lively disposition, the restless and exhilarating influence of which would

necessarily tend to promote the correct performance of the various animal functions, and hence would produce many of those conditions of the system which constitute, collectively, the sanguine temperament. It must not be imagined that the formation of this temperament depends solely on the enlarged chest. This is indeed an indispensable condition, but it is only one. If any of the more important organs of the human frame had, at the same time, an undue predominance, (the liver or the brain, for example,) the effects resulting from the combination would be so different from those just described, as to constitute another temperament. Although the highly oxygenated properties of the blood tend to invigorate the system, it is clear, that they cannot make that disposition cheerful and lively which is naturally melancholic or thoughtful, and consequently many causes may co-exist with the enlarged chest which may very much modify its influence.

The sanguine temperament is as strongly characterized by the ready flow of animal spirits as the vigorous condition of the organic functions. If the former were habitually wanting, the latter would not exist, or be only

very imperfectly developed. Some persons not well acquainted with the fundamental principles of the sanguine temperament, might so designate many constitutions from exhibiting a few of the qualities alluded to, such as the florid complexion, the animated disposition, and the generally healthy state of the body. These circumstances might, however, exist, and yet the essential conditions of this temperament, *such as the capacious chest, and the strong and full pulse might be wanting.* The vital fluid must be abundant, or the application of the term sanguine, cannot, with any degree of propriety be applied.

In those cases in which only a few of the characteristics of this temperament prevail, such as the buoyant spirits and the florid countenance, it frequently happens, that the muscular system is but slightly developed, and that the circulatory one possesses scarcely any of those conditions which imply great bodily vigour, and yet such cases are liable to be confounded with many which are classed under the head of sanguineous temperaments. The distinction between them is of great practical importance. This temperament is not subject to frequent disease. The disorders of the

digestive organs so common in nervous and bilious constitutions, are rarely observed in it unless they arise from sensual excesses, in which persons of this temperament are extremely apt to indulge, and when they occur, they are often accompanied with great irritability of the nervous system. The diseases characteristic of this temperament are those of an acute and inflammatory kind.

It has been repeatedly stated in the foregoing pages, that when the vital functions are energetically performed, any serious disturbance of them, whether from external or internal causes, very frequently gives rise to such affections, because the constitution is peculiarly predisposed to them. The treatment proper in these cases is the free abstraction of blood, and the vigorous employment of purgatives. It is only by such means, promptly applied, that we are able to control or arrest the inflammatory action before it has produced extensive disorganization. We must not, however, be regulated in the application of these measures by the degree of buffiness exhibited by the vital fluid, for this appearance depends not only on the violence of the inflammation, but on its situation, and will be

more or less evident according to the degree in which the lungs are affected.

The organs of the chest, in this temperament, are more frequently diseased than any other. It may, indeed, be laid down as a principle, that those parts of the system which have naturally the highest degree of activity, are, when disordered, liable to be acutely affected. From the preceding observations, these organs, in the sanguineous temperament, will be admitted to be endowed with vigorous energy, and hence, it is not extraordinary, that they should so often be the seat of acute inflammations. Enlargement of the heart, and ossification of its valves, are also not uncommon occurrences, and are chiefly attributable to the highly vitalized condition of the blood. This, even in those cases in which the powers of life are not inordinately excited, is possessed of considerable stimulating and nourishing properties which greatly develope the muscular system, and as there are causes occasionally in operation in this temperament, the decided tendency of which is to increase these properties, it is not surprising, that the heart, from the nature of its function, should become thus diseased. *Its accelerated action, and the rich*

quality of the blood which produces it, are amply sufficient to account for the morbid effects.

The consideration of the bilious temperament is involved in greater difficulties than that of the sanguineous, because it is, perhaps, less susceptible of precise definition. The views proposed concerning the latter, are, for the most part, simple and clear, shewing that the capacious chest, and the somewhat lively disposition, are the essential and principal indications of it; whereas, those marking the former, take into account a greater number of circumstances, some of which are but imperfectly understood; and still further, the views themselves appear too confined in their outline, not by any means embracing the whole of those peculiarities which may justly be regarded as constituting the bilious temperament.

Writers on this subject have described it as characterised by the capacious chest, and the large size, or undue activity of the liver, and have also stated the muscular system to be particularly well developed, so that the striking difference between this and the sanguineous temperament, would seem to consist princi-

pally in the greater influence which the liver exercises in the one case, than in the other. Now it appears to me, that there are numerous constitutions which possess none of the conditions enumerated, except the abundant secretion of bile, and that from this circumstance, they may be as truly said to possess a bilious temperament, as those which have hitherto been so considered.

No just reason can be assigned why the enlarged chest, and the well developed muscles should be considered necessary elements in this temperament. As the name given to it has undoubtedly been determined by the great activity of the liver, it was the duty of the physiologist to ascertain the organic peculiarities generally co-existing with it, which will be found, on close examination, more various than they are described. My own observations lead me to conclude, that the well-formed chest, and the fully developed muscles, are less frequently found connected with an undue predominance of bile, in the system, than the converse, and it is, therefore, necessary to consider the abundant secretion of it, in reference to these very different conditions of the body. In

thus treating the subject, another temperament will be included, which has hitherto been regarded as altogether independent of the rest, viz. the melancholic. The reason why it is proposed to unite the consideration of this with that of the bilious temperament is, that it seems to be founded on a state of mental feeling which is often associated with other temperaments, and particularly with the bilious ; and, besides as a feeling of the mind, the investigation of it is not likely to elicit many practical suggestions of importance.

In studying the sanguineous temperament it was stated, that a lively disposition is an essential element in it, and though constantly kept in view, it was, only as a point of secondary consequence, compared with the capacious chest. Both may, indeed, be looked upon as causes reciprocally acting on each other, and it is still probable, that the more or less lively disposition depends very much on the healthy stimulating properties of the blood, which are amply supplied by the vigorous action of the lungs. It must not, however, be understood from these remarks, that the natural qualities of the mind are not inherent in the organiza-

tion of the brain, any such doctrine would be absurd, and in laying a particular stress on the stimulating properties of the blood, it is only in reference to them as necessarily tending to excite and invigorate the cerebral functions.

In discussing the subject of the bilious temperament, the state of the mind that frequently accompanies it, will be taken into consideration, so that the peculiarities of the melancholic temperament will be noticed in the course of this inquiry. Those persons in whom the function of the liver is extremely active, are sometimes found to possess the most hardy and vigorous constitutions. The chest is capacious ; the muscular system is well developed, and, towards the decline of life, the body often shews a tendency to become rather corpulent. The pulse is strong and full, and animal heat is abundantly distributed throughout every part of their system. They have not, however, that florid appearance of the countenance occasionally so strikingly characteristic of the sanguineous temperament, but, on the contrary, a somewhat jaundiced, or sun-burnt aspect, conveying the idea of great bodily vigour which, in many instances, they really possess.

One very evident and important distinction between the bilious and the sanguineous temperament, is the greater development of the abdominal organs in the former,—the activity of which introduces numerous modifications into the animal economy, creates new susceptibilities and feelings, and gives rise to a fresh class of disorders, which require appropriate remedies. The constitutions of persons of the bilious temperament are liable to acute inflammations, but not by any means so much so, as those of the sanguineous ; and such as occur are frequently situated in the abdominal cavity.

In diseases of this kind, active depletory measures may be used with advantage, perhaps with greater safety and success than in those of the sanguineous temperament, because the fluids of the body are in greater abundance. It has previously been remarked, that those organs which exercise the highest degree of vital energy, are, when disordered, the most apt to become acutely affected. In accordance with this principle, the chylopoietic viscera, in the bilious temperament, are more susceptible of disease than any other. This temperament is peculiarly liable to functional derangement

and chronic disease : so that in persons possessed of it, even of the most robust constitutions, the digestive organs are occasionally disturbed in consequence of the undue action of the liver.

The symptoms indicative of such disturbance, are a yellow tinge of the countenance, deeper than natural ; a somewhat heavy expression of the eye, slight nausea, and a disagreeable taste in the mouth ; a furred tongue, flatulence, pain in the epigastric region, or an uneasy sensation in the stomach, which it is difficult exactly to describe ; an irregular condition of the bowels, a sluggish and inoperative state of the mind, and various other symptoms well known to the intelligent practitioner, all of which are generally removed by the unaided efforts of nature, or by very simple and ordinary means. The indications of derangement may be much less numerous and less striking than these, but, however slight, or apparently insignificant, they are important, as corroborating the principles previously laid down, which explain phenomena that would otherwise be less easy of solution.

The liability of the bilious temperament to the frequent recurrence of such disorders, is the cause of those serious structural changes so often detected in the liver, the spleen, or the alimentary canal. My own observation does not lead me to believe, that a melancholic feeling is characteristic of bilious constitutions possessed of great bodily vigour, but that the feelings of persons of such constitutions are, on the contrary, if not decidedly buoyant, often lively and animated. Their minds may be subject to occasional gloom, but this is quickly dissipated by brighter and more cheerful thoughts. Irritability of temper, great decision of character, and firmness of purpose, are the most striking traits of such constitutions. Those of less vigour often exhibit towards the decline of life, and sometimes much earlier, the phenomena of the phlegmatic temperament, such as obesity and a less energetic state of both mind and body. This change of one temperament into another, is extremely common, and it would be interesting to investigate the gradual manner in which the change is accomplished, but it could not be understood without entering more deeply into the consideration of this subject than it is

my intention to do here. It has been already remarked, that persons of the bilious temperament are prone to indulge in sensual gratifications, by which were meant the pleasures of the senses generally : though it has been truly stated, that, in such persons, the animal desire is particularly strong. This is a feeling of the mind, depending, perhaps, on the organization of the cerebellum for the degree of its manifestation : though it is indisputable, that the genital organs exercise considerable influence upon it. If their secretory functions are exceedingly active, it is very probable this desire will be frequently excited, supposing there is no decided deficiency in the cerebellic development ; as in such constitutions the whole of the abdominal viscera very energetically perform their several functions.

The naturally excited action of the genital organs will then explain the strength of the animal desire in persons of bilious temperament, for, if it does not directly produce this desire, it may render the relations between these organs and the cerebellum, so extremely intimate, that the whole apparatus, essential to the development and gratification of the

passion, may thus become acutely susceptible of impressions, and very ordinary causes be consequently sufficient to excite it frequently and ardently. The existence of this passion in a state of considerable vigour has generally been explained on the supposition, that it arises from the abundance and stimulating qualities of bile in the system ; but this opinion is not supported by any satisfactory evidence, resting apparently altogether on the assumed fact, that bile is a stimulus, and that its influence is not wholly confined to the digestive process, as is generally supposed, and that it is, moreover, fitted to excite the complex apparatus of the genital organs. If such, however, were the case, would not the urgency of the passion increase in the same proportion as the bile, till, in jaundice, it became altogether ungovernable ? With this question I shall dismiss this fanciful opinion, as scarcely worthy of further consideration.

It is now necessary to say a few words on the bilious temperament, when connected with, and characterised, by the delicately formed frame. The number of weak, bilious constitutions is much greater than that of the hardy and robust, and they are found particu-

larly among females occupied in sedentary employments, and persons of retired habits and thoughtful dispositions. The countenance in persons of this temperament exhibits a yellow tinge, variable in its degree, according to the more or less abundant circulation of bile : the chest is narrow ; the muscular system is imperfectly developed ; the generation of animal heat is extremely limited, as is evident from the undue susceptibility of the body to cold ; the pulse is rather small, becoming, after slight exertion, frequent ; the mind has a tendency to despondency, and the abdominal viscera are exceedingly liable to be disordered, and all the striking symptoms of indigestion appear.

The prevalent diseases of weak bilious constitutions, are chiefly situated in the abdominal cavity, the organs of the chest being very often diseased, as might naturally be expected, from the nature of the general morbid causes in operation, and, also, from the immediate vicinity of these organs to the liver and spleen, whose functions are frequently disturbed. In constitutions of this kind, acute inflammations are not very common ; and when they do occur, they are often the consequence

of chronic inflammation which has long existed, and are, on this account, much more difficult of cure than when the acute inflammation is primary. In acute inflammations, thus produced, active depletory measures are rarely admissible, being much too severe, as the powers of life are naturally feeble, and have probably been rendered still more so by functional disorder long preceding these diseases. The application of leeches and blisters, and small doses of emetic tartar, are the most valuable remedies in such cases.

Phthisis is often observed in such constitutions, but when it occurs, it is less frequently an effect of primary disease of the lungs than of constitutional derangement caused by disorder of the abdominal viscera. I have had numerous opportunities of investigating these differences, and my experience leads me to conclude, that the constitutional derangement, originating in this way, is a very fruitful source of this particular malady. In the one case, in which it is confined to the lungs, and hence may be designated simple phthisis, the functions of the bowels are little disturbed until the latter stage of the affection, when the mucus membrane becomes tuberculous; the countenance

is clear and rather florid, the tongue comparatively clean, the spirits buoyant, the appetite moderately good, and there is rarely much pain in the bowels, except from the operation of medicines, and the evacuations are, for the most part, pretty natural in appearance.

In the other case, which may be called compound phthisis, from the more general disorder of the animal economy, the bowels are much deranged at an early period of the disease, the motions continually varying in their character, and in the frequency of their evacuations, and there is, also, often much pain in some part of the abdomen, particularly on pressure being made over the epigastric and hypochondriac regions. The countenance is somewhat jaundiced, the tongue is generally much furred, though occasionally presenting a smooth polished appearance, but this does not by any means so frequently exist as its other condition; the appetite is indifferent, and the spirits are not unusually characterised by great despondency. It is difficult to select any two symptoms so decidedly opposed as the different states of the mind. In the one case, hope brightens and embellishes the future even to the tomb; in the other, it only occasionally

glimmers, and is quickly overcast with shadows. In this very general account of the two cases, it is only possible to point out a few of the more striking characteristics of each, leaving for subsequent consideration, the numerous gradations between the two extremes, the proper understanding of which would show how greatly disease of the abdominal viscera influences the respiratory organs, producing in them functional disorder which soon gives rise to evident structural changes; and how often, on the other hand, the disturbed action of these organs affects, in a similar manner, the chylopoietic viscera.

These differences are here mentioned, as suggesting opposite practical measures, or such as are very unlike in many important respects. In the compound species I have observed extraordinary benefit to accrue from emetics, even when the lungs have been diseased, as shown by difficulty of breathing, cough, expectoration, and pain in the chest, but there being every reason to believe, from inquiry and investigation, that these organs were secondarily affected. The employment of this practice has generally been accompanied with the application of leeches and blisters to the

abdomen. Were I allowed to draw any positive conclusions from my own experience respecting the beneficial use of emetics in such cases, I should be disposed to assert, that the great good which they have, by some distinguished practitioners, been said to produce in phthisis, was mainly attributable to this being rather of the compound than simple species. Has not the want of precise knowledge on this subject, then, been the cause of many discrepancies of opinion, and has it not had an injurious influence on the practice of medicine ? It has been stated in the foregoing pages, that the animal desire in bilious temperaments, characterised by vigour of constitution, is strong : this cannot be affirmed to the same extent, of those delicately formed. In these the powers of life are not sufficiently energetic to stimulate greatly the functions of the abdominal viscera, and therefore it cannot be expected that the genital organs should be particularly active.

In making these remarks, it must again be repeated, that the desire is looked upon as the result of a certain condition of these organs, and the degree of development and energy possessed by that part of the nervous system,

in which it is supposed by some entirely to originate. All feelings must, of course, exist in the mind, or rather be regarded as the mind existing in different states ; but it will not be doubted, that these may be produced by causes altogether apart from the sentient principle, and hence it may be just to view the different conditions of the genital organs, as causes tending to excite this passion, with various degrees of strength and frequency.

In studying the peculiarities of the animal economy, other temperaments, not less conspicuous than those which have already been pointed out, present themselves to the mind,—such as the phlegmatic, the muscular, and the nervous, each of which has its properties not less distinctly marked than those of the sanguineous and the bilious. The capacity of the chest in the phlegmatic temperament is large, but it would appear that the functions of the lungs are not particularly vigorous, as animal heat is by no means abundantly generated, judging from the susceptibility of the system to cold, the external appearance of the body and the state of the pulse. It is difficult to assign, in this instance, a satisfactory reason for the somewhat limited production of animal

heat. Many causes may be mentioned which have a tendency to circumscribe it, but they may all, perhaps, be deemed insufficient to afford a just explanation of the phenomenon. In this temperament the mind is not characterised by great activity. No decidedly restless and buoyant disposition manifests itself, continually leading the individual from one exhilarating pursuit to another, and thus promoting great muscular exertion, and it may hence be thought, that this circumstance will in part account for the limited generation of heat. There is not, moreover, an extraordinary degree of activity in the digestive organs, though it must, indeed, be confessed, that many persons of the phlegmatic temperament are unquestionably great eaters. The vigour and energy of the system do not, however, depend exclusively on the quantity or the quality of food taken, but greatly on its more or less perfect digestion and assimilation, and consequently it may not be unphilosophical to infer, that these processes are not so completely performed in this temperament as in that of the sanguineous or the bilious, united with a robust constitution. It cannot be doubted, that the digestive functions are very much facilitated by active bodily exertion and animated spirits,

which characterise the two last named temperaments, particularly the sanguineous, and therefore, the more bounded operation of these causes in the phlegmatic, may be one reason why the circulating fluid in this, is not endowed with highly stimulating properties. The muscular system, in this temperament, is very imperfectly developed, though it may, perhaps, appear otherwise, from the obesity which frequently exists. But if the muscles are examined, they are found soft and flabby, never firm and hard ; indeed, so far from possessing these qualities, the fat, whether on the cheeks, the abdomen, or the back, seems naturally tremulous, and displays this peculiarity on every slight bodily motion ; and still further, the fat is of a dead pale colour, conveying the idea that it is semi-transparent : such, at least, is the impression it always communicates to my mind.

The phlegmatic temperament is particularly characterised by obesity. This seldom appears, however, in a striking form, before the age of thirty ; yet, long before this, it is occasionally easy to point out those constitutions likely to become well marked examples. The pulse, in this temperament, is soft, and gener-

ally slow, rarely strong and frequent indicating great vital energy of the sanguiferous system ; did such energy indeed exist, the external appearance of the body would exhibit a more vigorous action of the capillaries, and there would also be a corresponding improvement in the production of animal heat. The colourless fluids of the body are more abundant in constitutions of this kind than any other. They invariably possess an undue predominance over the blood, whenever there is a great laxity of the muscular fibre, and a general want of tone in the vital powers ; but when different conditions exist, as in the sanguineous temperament, there is a proportionately greater quantity of the blood. It is highly important to keep this principle in view, since it affords the best explanation of the origin and nature of many diseases, and establishes just rules of practice.

The nervous system, in phlegmatic temperaments, possesses only a limited degree of sensibility, and the mind displays little of that restless and spirit-stirring temper so peculiarly characteristic of the sanguineous constitution ; although it may evince considerable speculative ability, it seldom manifests much activity

in undertakings requiring bodily exertion. Its habitual disposition is the love of ease. The nervous system belonging to organic life, appears as little susceptible of impressions, as the brain and its system of nerves. The same general character distinguishes both systems, and this prevailing agreement exists in every species of temperament. In the sanguineous, for example, the mental operations are quick and lively, and those of the body manifest an equal degree of energy. This correspondence is attributable to conditions inherent in the organization of the nervous mass, and to the more or less perfect development of the important instruments of life. It appears probable that the whole of the nervous system, though its various parts are the seat of independent faculties, partakes of these corresponding qualities, because it is formed pretty nearly at the same time under the influence of the same vital principles, and is similarly situated in every respect during foetal existence. In this way it is easy to account for this prevailing agreement between the different parts of the nervous system ; the explanation must, however, be received with considerable limitations, since one of them may be developed to a much greater extent than any

other, and, consequently, display great energy whilst the rest are comparatively inactive. That such is indeed the case is by no means satisfactorily established by the indications of the body in a state of health, and my own opinion is rather opposed to it, always recollecting what is meant by the correspondence of the nervous system, viz. *a greater or less degree of susceptibility of impressions generally without particularizing whether these lead to intellectual operations, to the exercise of motion, and the increase of sensibility, or to the performance of other vital functions.* In many instances, in which the brain seems predominantly active, the rest of the nervous system will be found, on close examination, to be in the same condition, or at least to possess the capability of being vigorously excited, proving all that is necessary for the argument, which does not require that the nervous system generally should be as really active as the brain, *but only that it should be characterised by a corresponding degree of inherent susceptibility.* This reasoning would perhaps be more intelligible, if the nervous system of the phlegmatic temperament were compared with the sanguineous, leaving the brain in both entirely out of consideration. In the former, a punc-

ture or wound seldom occasions that degree of irritability and fever which it produces in the latter ; a difference arising from the various degrees of susceptibility possessed by each. In the sanguineous constitution, the brain, may be predominantly energetic, whilst the remaining part of the nervous system does not exhibit equal activity, though a corresponding condition may at the same time exist in both, *because the latter is endowed with properties which render it capable of being similarly excited, and in a high degree compared with the same system in the phlegmatic constitution.* It has been stated that this agreement depends, also, on the more or less perfect development of other parts of the animal system. If the organs of the chest and abdomen vigorously perform their several functions, the circulating fluid will possess highly nourishing and stimulating qualities, and will, therefore, confer on the nervous system, as well as on the whole animal economy, an acute susceptibility of impressions—a susceptibility which may be regarded as a sort of measure of the existing extent of vitality.

The whole nervous apparatus becomes thus assimilated in general properties. If the cir-

culating fluid is less exciting in its nature, this apparatus fails to acquire great susceptibility and energy of function, and accordingly its various parts, if not originally constituted alike, will generally display a corresponding degree of inactivity. In proof of the influence of such circumstances, it is only necessary to allude to the important changes which often take place in the character of the constitution at different periods of life—changes which must be altogether referred to modifications occurring in the functions of the more important organs, whose office it is to digest and assimilate food, and not to any primary alteration in the nervous system.

When the sanguineous temperament passes into the phlegmatic, the nervous system gradually loses its susceptibility as every other part of the animal economy does its distinguishing degree of vitality ; but these are effects arising from the causes pointed out,—effects which may themselves, indeed, become causes, and facilitate the deterioration of the powers of life. To explain the particular mode in which this is accomplished would lead to the consideration of subjects that are extremely abstruse in their nature, the investigation of

which is, moreover, not at all necessary to my present purpose.

The functions of the stomach are not particularly liable to be severely disturbed in the phlegmatic constitution by any indulgence in sensual gratifications, in consequence of the little sensibility possessed by the nervous system ; for if this were more acutely alive to impressions, those of a morbid description would be readily produced by the undue quantity, or the pernicious quality of food, or an excess of spirituous liquors, and would be immediately transmitted from the organ primarily affected throughout the whole animal economy, creating fever and much functional disease. Such effects are extremely common in the sanguineous and nervous temperaments, in both of which there is considerable susceptibility. Persons of the phlegmatic constitution will frequently bear an inordinate quantity of stimulants without becoming inebriated, a fact which my own observation has abundantly proved, and this can be explained, in a satisfactory or plausible manner, only on the principle just stated. Without entering at length into the consideration of the cause and nature of inebriation, it cannot be doubted,

that the disordered condition of the mental faculties is referable to too great an excitement of the brain, and hence those, in whom the nervous system naturally possesses little sensibility, will, all other things being equal, be much less apt to be affected by stimulants than others in whom this property is fully developed.

In confirmation of this opinion it may be observed, that persons not habituated to spirituous liquors are very soon intoxicated, because the nervous system in them is suddenly excited from being brought within the influence of a class of agents to which it is comparatively a stranger; and even those who occasionally indulge in spirituous potations, sometimes become inebriated long before they have taken their usual quantity, in most of which cases it can be shown that much previous excitement existed, arising from irritated or highly exhilarated feelings, which predispose to inebriation, *because they render a less proportion of stimulants necessary for its production, in consequence of the extent of the previous excitement occasioned by them.*

This explanation may, perhaps, appear ques-

tionable from the well known fact, that persons depressed in spirits, are, also, readily intoxicated, and as this circumstance arises from a state of mind quite opposite to the one alluded to, it may be regarded by some as entirely subverting the arguments which have been used in the consideration of this subject. The objection which is founded upon it, is, however, of little importance : since it is not a necessary consequence of the prevailing state of the mind being despondent, that the action of the brain should be depressed. The converse of this may be the case, and very strong evidence may be adduced in corroboration of the fact. It will not be disputed, whatever ideas may be entertained on this matter, that the susceptibility of the nervous system is much increased by mental despondency ; often displaying itself in the least equivocal, and the least agreeable form of extreme irritability. The animal desire in the phlegmatic constitution is weak, which, as already remarked, depends very much on the organization of the nervous system. When this possesses acute susceptibility, very slight causes, particularly if the powers of life are in a vigorous condition, are amply sufficient to excite the passion. Hence the action of the genital or-

gans would naturally be expected to correspond with the rest of the state of the animal system, and such is undoubtedly the fact.

The change of one temperament into another, during the gradual advancement of life, has been alluded to in the foregoing pages, and its consideration here, though highly interesting, would exceed the limits prescribed to this inquiry. The sanguineous and the bilious temperaments frequently pass into the phlegmatic; the phlegmatic very rarely, if ever, passes into the two former. They may, by sensual indulgences and obesity, lose much of their characteristic sensibility and vitality, and thus imperceptibly assume the distinguishing properties of the phlegmatic constitution; but it is scarcely possible for this, by any changes in the mode of living, the habits or the pursuits of life, to acquire the conditions of the other two, *because they are inherent in the organization of the animal system*. The prevailing diseases of this temperament are chiefly of a chronic nature. Those of an acute inflammatory description do not often occur on account of the limited degree of energy possessed by the vital powers: and when they do, they are more frequently the consequence of

congestions, or of slow morbid changes, than of any immediate disturbance of the healthy actions of the body. By these gradual, and for some time, imperceptible deteriorations, different organs are liable to attack, though they do not commonly affect one or two, in particular, as in the sanguineous and bilious temperaments. In these the constitutional character may be said to present inequalities, as its uniformity is broken by the more vigorous exercise of certain functions belonging to the thoracic or the abdominal viscera, whilst in the phlegmatic this character is pretty nearly the same throughout the animal system. The well marked outline is certainly not disturbed by the undue activity of any organ, and, therefore, every part of the body is almost equally liable to disease. Accordingly, chronic disorders are observed in the lungs, the chylopoietic viscera, the glandular system, and in the more important articulations of the bones.

In children, the glands, particularly those of the neck and the abdomen, are most commonly diseased. At a more advanced period of life, constitutions that manifest this tendency, are subject to chronic affections of the

spine and the larger joints, or of the mucous membrane belonging to the alimentary canal, or the respiratory apparatus. The secretions from this membrane are naturally copious, and are extremely apt to be very much increased on any slight derangement of its functions, which arises from the deficiency of vigorous action in the capillaries, and the same cause determines the greater part of the diseases peculiar to such constitutions. In persons of this temperament, the robust appearance which indicates health and capabilities of undergoing fatigue, is deceptive: for long continued exertions, or sickness, and only moderately active depletory measures, reduce, in a very extraordinary manner, the tone and energy of the vital powers; the body quickly losing its fleshy character, and its numerous operations becoming extensively deranged. Symptoms showing a predisposition to consumption, such as a frequent cough, pain in some part of the chest, and occasional difficulty of breathing, have often come within the range of my observations, occurring in individuals between the age of sixteen and thirty, but which generally become milder, and entirely disappear with advancing years. The severity of these

symptoms is very much aggravated by a cold moist atmosphere, and speedily relieved by a few warm sunny days. Were I allowed to hazard a conjecture respecting the cause and nature of them, I should say, that they consisted principally in the irritation and increased secretions of the mucous membrane lining the air-passages, and are liable to be produced by whatever disorders its functions, but do not originate in any disorganization of the substance of the lungs. The latter are, in some instances, but not generally affected in these cases.

Dropsies are not uncommon in this temperament, particularly those characterised by debility, and which are not preceded by acute inflammation. The want of energy in the capillary vessels and the vital powers, explains the frequent origin of them; they are indeed rarely observed under any other circumstances than these, except when produced by manifest inflammation. The consideration of the treatment proper to be pursued in diseases occurring in this temperament is important. It is evident from the foregoing observations, that active depletory measures are scarcely admissible. Even in cases of acute inflam-

mation we must employ them with great caution, keeping constantly in mind the debility inherent in almost every part of the animal system. The little apparent vigour existing is quickly dissipated.

Constitutions which have acquired the phlegmatic temperament must not be altogether confounded with those in which it is natural; for the former, although displaying some of the striking conditions of it, possess occasionally considerable energy, and will in consequence bear much more active treatment than the latter. It is highly necessary to make this discrimination, nor is it difficult in most instances. When the temperament is in a great measure acquired, arising from gradual changes in the sanguineous and bilious constitutions, it is generally accompanied with a development or firmness of muscle and a strength of pulse much greater than when it is natural. Venesection must be applied with the greatest possible care, because, as previously observed, the blood is less abundant in this temperament than in any other, compared with the rest of the circulating fluids, and its properties are also less stimulating. These are facts which cannot be

called in question, and if clearly apprehended, they will suggest modes of practice adapted to the numerous diseases or various modifications of them that may occur. The temperament to which we shall now direct a few brief remarks is the muscular, so designated in consequence of the strong development of the muscular system, unaccompanied by the predominating influence of any of the conditions characteristic of the other temperaments.

The one with which it may be confounded is the sanguineous, in consequence of certain intimate relations existing between the two. The muscular may perhaps be considered the sanguineous constitution without its abundant circulating fluids. The latter has been described as possessing to an extraordinary extent, the energies of life, particularly those of the sanguiferous system, the invigorating influence of which is necessarily felt by every part of the animal economy. In the former, this system is fully developed, and the blood is also endowed with considerable stimulating properties, but it does not appear as in the sanguineous, full even to distention. It conveys, however, the idea of

being amply sufficient to give health and vigour, but not an exuberant degree of action to the vital powers. The body, though by no means fleshy, exhibits an uncommon prominence of muscle, which is hard and firm, possessed of great strength, and seems altogether destitute of fat. The abdomen is extremely small and the chest generally very well developed, but perhaps scarcely to the same extent as in the sanguineous temperament. The superiority of the latter may, however, be only in appearance, arising from the more fleshy condition of the muscles and integuments of the chest.

It cannot be doubted that the respiratory organs in the muscular temperament, vigorously perform their functions, for those who possess it are capable of undergoing, with ease, great fatigue, and violent exercise, in which, the free play of these organs is imperatively required. The production of animal heat is abundant, as proved by the facility with which persons of this temperament bear cold, and exhibit such an appearance of the body, which, though rarely decidedly florid, indicates, nevertheless, considerable action of the sanguiferous system. The pulse is hard, and rather fre-

quent than otherwise, but, by no means, so full and bounding as in the sanguineous temperament.

Persons of the muscular constitution are active and strong, and hence it may be justly inferred, that that part of the nervous system, in which motion resides, is endowed with great energy, which rarely co-exists with acute sensibility; for even leaving out of consideration original differences between these two properties, the pursuits or habits of life, which tend to give a predominance to one almost necessarily circumscribe the action of the other. Individuals of this temperament do not exhibit in health, though they do frequently in disease, an acute susceptibility of external and internal impressions, and they seldom manifest any striking degree of talent. They often display considerable activity of mind, but chiefly in trifles, whilst they glide superficially over matters of importance, seldom exhibiting that philosophic turn of thought, or that fixedness of purpose, which conduct to great excellence in the higher departments of science. Nature has, however, given them a happily-constituted frame, and their health is not apt to be injuriously affected by the ordi-

nary accidents of life, such as the vicissitudes of seasons, alternations of heat and cold, or slight irregularities in diet and regimen ; nor are they particularly predisposed to any diseases, although certainly more liable to those of an acute than those of a chronic nature.

Amongst those of the former kind, rheumatism is, perhaps, the most common, and, after this, inflammatory affections of the respiratory organs. Chronic disorders rarely occur, as this temperament does not admit of frequent functional derangement, which is the cause of such disorders.

On the treatment proper to be used in these different cases, it becomes me to speak with diffidence, as my own experience has been too limited to authorise any positive directions. In combating acute inflammations, active depletory measures may be advantageously employed, at the first, but the repetition of them will not be so well borne in the muscular as in the sanguineous temperament, perhaps in consequence of the circulating fluids being less abundant than might be supposed from the energy of the vital powers. When functional disorders occur in this temperament,

confinement to the house, and the application of only ordinary remedies, produce, in a short time, very evident changes in the appearance of the body, which becomes lean, pallid, and extremely sickly : in this case, there is generally great irritability of the mind, as well as of the animal system.

Differing from the foregoing temperaments is the nervous, which is peculiarly distinguished by an acute susceptibility of impressions, frequently showing itself in an irritable and hasty disposition. Persons of this temperament are generally remarkable for talent ; they are active, mostly lean, and very rarely possess the capacious chest with its attendant conditions of health and vigour. The countenance of such persons is pale, the features sharp and intelligent, and the constitution delicate and soon disordered by sensual indulgences, exhibiting the symptoms of dyspepsia, accompanied by a morbid degree of irritability.

One of the most obvious differences between indigestion occurring in this temperament, and in any of the preceding, is *the great irritability attending it* : the patient losing all equanimity of temper, complaining of palpitation

of the heart, and very apt to fancy the existence of a thousand evils, which are altogether imaginary. This temperament is found most frequently among females; though many striking instances of it occur in the other sex. When the vital powers of the former are disordered, the uterine functions are extremely liable to be affected, the ordinary evacuations being either partially or entirely stopped. The implication of these functions, indeed, in the existing derangement will alone satisfactorily account for the various symptoms which are exhibited.

In considering the bilious temperament it was observed, that it is particularly susceptible of impressions, the chylopoietic viscera, in persons possessing it, being frequently deranged; and hence it may, perhaps, be thought very similar to the nervous temperament. Each, however, has its distinguishing conditions. In the bilious temperament, characterised by the robust constitution, the organs of the chest and abdomen are much more fully developed than in the nervous, and, when affected with indigestion, the superabundance of the vitiated qualities of bile, is a predominating symptom which does not exist in the latter, to anything

like the same extent as in the former. In the bilious system, delicately formed, this symptom is, perhaps, still more evident, and the frequent disorder of the chylopoietic viscera in this system, points out a wide distinction between it and the nervous constitution.

In the latter, as its name seems to imply, the great activity of the nervous system, is a peculiar characteristic, unaccompanied by any undue action of the important organs of the body. Many unequivocal indications show, that the lungs and the chylopoietic viscera are only moderately exercised. The constitution, indeed, seems delicate, but this delicacy is perhaps to be referred less to any particular organ than to the whole frame, and is probably not so great as might be supposed from a superficial acquaintance with the nervous temperament, since persons possessing it are often capable of bearing great exertions, frequently too, with more ease than those who are considerably more robust in appearance, owing to the tone and energy derived from the activity of the nervous system. Physical strength cannot be measured by the existing quantity of flesh, because it depends very much on the development and inherent vigour of the

nervous system, which cannot be estimated by the eye.

The nervous temperament is predisposed to both acute and chronic diseases, but more particularly to the latter. The acute are more frequently situated in the respiratory apparatus than in any other part of the body, and are apt to be occasioned by sudden vicissitudes of the seasons, or abrupt transitions from heat to cold, the vital powers being incapable of resisting the influence of these causes: the chronic are generally seated in the organs of the chest or abdomen, or in the nervous system itself. The liability of this temperament to chronic diseases would naturally be expected from a consideration of the various circumstances, calculated to disorder constitutions delicately formed, as those, designated nervous, generally are.

On the mode of treatment proper to be pursued in this temperament, it is almost unnecessary for me to dwell, having in the preceding pages expatiated pretty largely on this subject, in reference to other temperaments. Little difficulty will be found in making the modifications imperatively required in the practical

principles already laid down, in order to adapt them to cases not particularly mentioned, the general operations of the animal economy, and some of their leading peculiarities, having been previously described. Acute diseases attacking the nervous constitution may, for the most part, be successfully treated by leeches, small doses of emetic tartar, and occasional purgatives. The constitution will certainly not bear active depletory measures. Chronic diseases, although very dissimilar in their nature and symptoms, are generally relieved by tonics, because they are often produced or aggravated by debility.

On some subsequent occasion, the important subjects of this Chapter will be more elaborately considered than they possibly can be within the limits of this disquisition, and their scope and tendency will then be better understood.

CHAP. III.

*The necessary Connexion between the Powers of
Organic Life.*

HEALTH is the result of the proper action of the various organs which constitute the animal economy. The serious derangement of one, readily disturbs the rest, but the way in which such disturbance is produced, has never been satisfactorily explained. It has generally, however, been attributed to the agency of the nervous system. In the “Experimental Inquiry” I have dwelt, somewhat at length, on this subject; attempting to shew that the more striking phenomena of sympathy, occurring in disease, may be exclusively traced to alterations in the properties and distribution of the blood; and the truth of this opinion will be rendered more probable from the facts and arguments adduced in this Treatise, and in others that will shortly follow it. The laws by which sympathetic action is produced, will be necessarily developed in elucidating the origin and nature of diseases, and the number-

less modifications which they exhibit arising from natural differences of constitution, influence of climate, habits, atmospherical vicissitudes, local peculiarities, and other causes. A knowledge of the more important functions of the body and of the mode in which they are severally affected, by external and internal agents, cannot fail to lead to the discovery of the principles which produce their harmonious action, and also, of the manner in which the disorder of one communicates its injurious influence to others. One of the most philosophical writers of the day states, that “the brain and nerves seem to be the common centre, or general medium, through which the reciprocal influences of the different parts of the animal economy are exercised; the organs which first sympathise with local affections, and which, by their reaction on the other organs and systems of the body, produce in them all the variety and diversity of morbid constitutional effects which we perceive to occur in disease.” * In corroboration of this opinion, the observations of Dr. WHYTT, on the subject of sympathetic actions, are adduced at considerable length; but many of the phenomena which he attempts to explain, on the

* Lectures on Inflammation. By Dr. JOHN THOMPSON. p. 90.

supposed influence of the nervous system, may be more rationally accounted for on other and simpler principles.

As the blood is the source from which all secretions are derived, and as it contains all the properties essential to the operation of the complicated powers of life, every serious derangement of those properties will necessarily produce morbid effects in the system, either local or general, proportionate to the extent of the deviation of the sanguineous fluid from a healthy condition. Plain and almost self-evident as this inference appears to be, and clearly as it shews the great importance of a strict attention being paid to the modifications of the sanguiferous system, these modifications have not hitherto formed a subject of particular investigation ; and the agency of the blood has consequently not been clearly understood, nor ever applied to the explanation of sympathetic phenomena. Modifications in it have indeed been frequently observed in diseases, and allusions have also been made to them as characteristic of the nature of the morbid affections, but all the research and ingenuity of physiologists have yet thrown scarcely any light on their origin

and influence, which cannot indeed be at all comprehended without a previous knowledge of the causes which affect the qualities of the blood.

A knowledge of these causes will lead to a correct estimate of the relative value of the powers of life, and when this is ascertained, those which are known to exercise the most extensive control will be easily investigated. Respiration may be justly regarded as the most important of these powers, and ought accordingly to receive the first consideration. The various actions of the animal economy are more immediately and more extensively disturbed by the derangement of this function than perhaps of any other.

If respiration is impeded, the chemical changes in the lungs are imperfectly performed, and blood destitute of healthy, stimulating and nourishing properties is consequently diffused throughout the body, occasioning much general and local disease; but if, on the contrary, it is unduly excited, these changes are proportionately increased, as blood too stimulating in its properties is circulated, producing both local and general disorder,

though of a very different character from that which succeeds a depressed state of the sanguiferous system.

Digestion, circulation, nutrition, absorption, exhalation, and secretion, are all equally dependent on a healthy state of the blood for the correct performance of their respective offices ; since every decided derangement of it invariably gives rise to corresponding alterations in these functions.

It is, then, easy to appreciate generally the nature of the connexion existing between respiration and these several vital powers. None but those who have paid considerable attention to this subject, can, however, form any just conception of the enlarged practical views it suggests, of the numerous phenomena it explains, and of the many absurdities and fallacies it exposes in the prevalent doctrines relating to sympathy. Whether the deterioration in the qualities of the blood succeed the influence of external agents—of depressing emotions—of injuries of the brain—or of impediments to the circulation in the heart or lungs, it is to be traced to alterations in the quantity of the vital fluid, submitted at

any one moment to the action of the inspired air; for these various causes are all capable of disordering the natural relation existing between the proportion of blood in the lungs and the atmospheric air which is inhaled.

The modifications in the properties and distribution of the blood cannot, however, be justly ascribed to the derangement of the respiratory function solely, when that derangement is of long continuance, since, in that case, they are partly produced by disease of the different organs which contribute, either directly or indirectly, to the production of chyle: for if this fluid is deficient in its ordinary nourishing qualities, the arterial blood will necessarily experience a deterioration, although the conditions of the respiratory organs, essential to the chemical changes of the blood, may at the same time be only slightly affected.

Derangement of the digestive apparatus, existing for a few weeks or months, disorders the numerous powers of life, and consequently prevents the production of a proper quantity of chyle, or injures its nourishing qualities, as this fluid is the result of a series of vital actions, and not of those alone which

appear to be solely employed in its formation. A morbid condition of the digestive organs occasions disease in every part of the body ; especially in the nervous system, the disordered state of which is indicated by frequent and severe headaches, indisposition to exert, or inability to continue muscular motion, depression of spirits, a restless and irritable state of mind, and various other symptoms, which are generally regarded as purely nervous.

We have, also, the clearest evidence that the heart and the lungs are affected by a derangement of the digestive organs, as well as the qualities and distribution of the blood—the functions of secretion, absorption, and exhalation. It may not indeed appear easy, amidst so extraordinary a complication of disease, to trace every particular disorder to its direct cause : if it were, however, the time to enter upon such inquiry, it is probable that a much greater exactness of knowledge might be shewn to be attainable than would be supposed possible in the existing state of physiological science. The difficulties of the subject arise in a great measure from the numerous effects succeeding a morbid action of the digestive apparatus, and the continual conver-

sion of these effects into causes, which rapidly propagate disease from organ to organ, until the whole system is extensively affected. The truth of these observations will be more clearly perceived when the combined causes, symptoms, and treatment of indigestion have been fully explained. It is, however, evident from these remarks and others, which have preceded them, that every inquiry into the functions of organic and animal life necessarily tends to elucidate the origin, nature and complication of diseases, and can scarcely fail to suggest correct principles for the regulation of medical practice.

CHAP. IV.

The influence of Respiration on the distribution of the Blood.

IF the more important functions of the animal economy were investigated and satisfactorily ascertained, previous to the consideration of the origin and nature of diseases or the principles of treatment, the science of medicine would soon present enlarged and definite views, so simple and easy of apprehension, that the most ordinary understanding would readily appreciate and apply them. A less philosophical mode of inquiry has, however, been generally adopted. An undue anxiety has been shewn to penetrate immediately into the condition of disease, as well as to discover specific remedies, though the successful attainment of either object, depends almost altogether on the extent and accuracy of the knowledge possessed concerning the healthy actions of the system, and the manner in which they are severally and conjointly liable to be deranged.

As it is my intention, in the subsequent pages, to examine the character of various morbid affections—their predisposing and exciting causes—their particular as well as their general effects, and to consider the principles of treatment which will naturally be suggested by such an examination, I shall, in the first place, state a few of the important laws which regulate the well being of the animal economy. An acquaintance with these will readily explain how the variations of temperature, the vicissitudes of seasons and mental emotions, produce acute and chronic diseases, and necessarily lead to the adoption of practical measures which can scarcely fail either to ameliorate or remove them.

The function of respiration, as it affects directly the qualities of the blood, and indirectly, by means of this fluid, every part of the organized system, merits the first consideration. The character and extent of the chemical changes to which it gives rise, can be ascertained only by a knowledge of its two acts, inspiration and expiration.

To the neglect of physiologists in not investigating the influence of these two functions

separately is to be attributed much of the absurdity and incompleteness of the views generally held concerning the production of animal heat, and the manner in which the circulatory system is liable to be disturbed, as well as the origin and nature of numerous diseases. It will scarcely be doubted, that it is by means of respiration that the blood is oxygenated, and that whenever its properties are vitiated in consequence of the oxygenation not being complete, the whole system will be more or less deranged.

The subject of respiration has been treated at considerable length in the “Experimental Inquiry,” and it is, therefore, my intention to adduce here only the more important of those principles, which have already been elucidated, in order to shew their utility in explaining the various phenomena of disease. An inspiration draws in the quantity of air necessary to support the chemical changes of the blood; an expiration expels that which is deprived of its vital properties. *It may, perhaps, therefore, be inferred, that one act will invariably succeed another, and that the quantity of air inspired will be exactly proportionate to that emitted by the previous expiration, so that the generation of ani-*

mal heat cannot be influenced by a preponderating degree of completeness or frequency in either of the individual acts. Such inferences will, however, be found, on mature examination, to be incorrect. Inspiration and expiration are susceptible of two modifications, *a change in the frequency and in the fulness of their respective acts.* In speaking, for example, there are many expirations in quick succession, whose constant expenditure of air is supplied by deep inspirations, made at intervals, which are equivalent to the more numerous but less complete expirations. It may, perhaps, be thought that the qualities of the blood cannot be much influenced by a preponderance in the frequency of expirations, as the inspirations, though few, contribute, within a given period, a quantity of air equal to that which has been expelled. But that the properties of the blood are thus considerably affected, and that this is a necessary consequence of frequent expiration will be evident on considering the condition of the vital fluid in the two opposite states of respiration. If the quantity of blood in the lungs underwent no modification whatever during the two functions of respiration, the undue action of one would certainly be productive of no particular result; but as the quantity of

blood circulating in these organs, is materially affected by the predominating exercise of either of the aforesaid functions, it naturally follows, from principles developed in the “Experimental Inquiry,” that its qualities will also be greatly modified by such exercise.

All expirations give rise to muscular actions more or less energetic, besides those necessarily excited in the organs of speech and respiration. In laughing, and in animated conversation, we perceive the activity of different parts of the animal frame. It is, indeed, extremely difficult in such acts, to restrain the involuntary motions of the body, which, whether moderate or violent, concur with the repeated expirations to increase the rapidity of the circulation of the blood through the lungs, to lessen the quantity existing at any one moment in them, and to facilitate, by this means, those chemical changes, which, by invigorating the contractions of the heart, lead to its more general diffusion. Strong muscular exercise always occasions a quicker circulation, a more equable distribution of blood, and an augmentation of animal heat. *It cannot, however, produce these effects in any other way, than by diminishing the quantity of blood, existing at any*

one moment, in the lungs, and by accelerating its motion through them—conditions essential to an improvement in its vital properties. If it can be shown that frequent successive expirations occasion similar changes, differing only in degree, these must, of course, be referred to the operation of like causes. Now, an examination of the pulse of any one much excited, of his susceptibility to heat or cold, and of the appearance of his countenance, will prove, that the circulation and the qualities of the blood have experienced modifications proportionate to the influence of the respective causes in operation.

It is impossible for any one who has closely attended to the subject, to deny, that such are the phenomena resulting from great mental excitement, though he may call in question the correctness of the views proposed to account for them, supposing them, perhaps, to arise from the gentle but continuous exercise of the body. It will not, however, be disputed, that so far as conversation and laughter bring into play many muscles, directly connected with the organs of speech and respiration, they are to be regarded as co-operating with any other cause which may be assigned as

tending to diffuse the blood equably throughout the body, and consequently leading to important changes in its properties. This concession is all that is necessary to the argument : for if it can be shewn, that expirations do invariably give rise to these modifications, it is obvious, without reference to particular principles, that they ought to be considered amongst the causes which affect the circulatory system. Exhilarating emotions, which never fail to excite and invigorate the vital powers, must communicate their influence, through some channel, and the benefit they confer, must be somewhat different in its operation, from a nervous or electric fluid, *because the alterations in the qualities and circulation of the blood cannot be satisfactorily explained by the supposed existence of such a fluid* : alterations, however, which sufficiently account for every improvement in the system, being produced by the ordinary kinds of bodily exercise in which the mind is little, if at all, interested. When we perceive the same effects arising apparently from very different causes, the object of the philosopher ought to be to ascertain, if possible, the nature of the difference between those causes, if indeed it be more than apparent. It is sometimes easy

to ascend from known to unknown causes : and, in elucidation of the subject which we are considering, the former will enable us to determine the latter.

It has been shewn in the “ Experimental Inquiry,” in what manner, warmth and exercise augment the oxygenated qualities of the blood and the temperature of the body, viz. : *by diminishing the quantity of the vital fluid circulating at any one moment in the lungs*, in consequence of which the inspired air is enabled to effect extensive chemical changes in it. We have, then, in regard to the influence of exercise and warmth, established data which, if they do not unequivocally demonstrate the fact, render it at least probable, that all causes productive of the same effects have a similar mode of action.

It will scarcely be doubted, that expirations excite different kinds of muscular contractions, some of which are necessarily, whilst others are, only incidentally, associated with them. Of the former class, are those belonging to the organs of speech and of respiration ; of the latter, the occasional movements of the arms, or the generally restless state of the body, dis-

played in moments of vehement passion or excitement.

As it has been clearly shown in the work just alluded to, that mental emotions, whether of a lively or depressing description, communicate their beneficial or injurious influence chiefly through the respiratory function, promoting those conditions of the sanguiferous system which are more or less favourable to the chemical changes of the blood, and we have consequently, the same kind of evidence in support of the views which explain these phenomena, as we possess concerning exercise in general. I am thoroughly convinced that those individuals, whose pursuits call into frequent use the vocal organs, or whose disposition is naturally talkative and lively, enjoy much better health, and are less delicate in appearance, than persons of a taciturn and melancholy temper. The former have, frequently, a florid complexion, and possess good appetites, being more subject to acute, than to chronic diseases: the latter, on the contrary, are generally of a pale and sallow complexion, have small or fastidious appetites, and are particularly liable to chronic affections. *These striking*

diversities are principally to be referred to habitual differences in the conditions of the blood.

In childhood there is every kind of muscular action calculated to increase the vital properties of this fluid. The playfulness, and frequent laughing and crying, at this period of life, excite those changes in the system favourable to its nutrition and development. We observe not only the kindly operation of these causes, but the absence of others, such as anxiety, regret, and disappointment, which arrest the expression of joyous emotions, or disturb the serenity of the peaceful mind. The sorrows of the child are expressed in loud and continued cries, which are violent expiratory acts tending to accelerate the circulation, and to improve the qualities of the blood.

It has been demonstrated by physiologists, that, during inspiration, the blood returns to the chest with greater facility than during expiration, and consequently, in a given time, in greater quantity. That it is possible to influence materially the distribution of the blood, by a series of inspirations, I have ascertained by experiment.

In the trials which I have made, in the space of a minute, I induced engorgement of the lungs, as indicated by the acute pain occasioned, and the increased frequency, but diminished strength of the pulse. Involuntary inspirations are often made when the mind is particularly absorbed by deep thought, in which case they arise from congestion of the thoracic organs, caused by suspended or imperfect breathing. The same phenomena are observed on the occurrence of sudden fright, but, in that case, they are not excited by the surcharged state of the lungs, but by the instantaneous influence of the mind, transmitted to the respiratory apparatus, invariably producing, however, internal congestion, and consequently sometimes causing immediate death. This is proved, or at least rendered extremely probable, on *post-mortem* examinations of those who thus die, since they always exhibit considerable engorgement of the thoracic organs ; but even when death is not the result, the symptoms occasioned by sudden fright indicate an internal accumulation of blood, such as coldness of the extremities and surface of the body, difficulty of breathing, and small, frequent, and, sometimes, almost imperceptible pulse. Deep involuntary inspirations are then

to be ascribed to either of these two causes :
*a sudden emotion of the mind, or a disturbance of
the sanguiferous system.*

From these observations it is obvious, that the function of respiration will be imperfectly understood, unless the precise operation of its two acts be satisfactorily ascertained. It was, indeed, by attending to these that I was enabled to discover the manner in which the mind affects the body, the laws of animal heat, and also the dependence of digestion on the proper qualities and distribution of the circulating fluid.

CHAP V.

*Animal heat is proportionate to the changes produced in the properties of the blood in the lungs, and these changes are invariably in the inverse ratio of the quantity of blood circulating in the lungs at the same time.**

A KNOWLEDGE of the changes in the distribution of the blood, whether arising from the undue action of either of the two functions of respiration, or from any other cause, must necessarily throw considerable light upon the generation of animal heat. Whenever the blood becomes decidedly *internal* in its circulation, its properties are deteriorated, and the temperature of the body is diminished; when it is *external*, the properties are improved and the temperature is increased.

The inquiring mind can scarcely perceive the striking relations which exist between the conditions of the circulatory system and the degree of animal heat dependent upon them,

* See note A.

without feeling a strong inclination to examine them closely, in order to discover, if possible, the laws by which they are regulated. Physiologists, in their attempts to unravel the difficulties of the subject, have instituted experiments for the purpose of ascertaining the quantity of air inspired in a given time, the alterations it undergoes in the lungs, and the degree of heat produced by those alterations, or showing that the generation of animal heat is attributable to the nervous system and not to any chemical action. As this important subject has been fully discussed in the "Experimental Inquiry," my present remarks will be few, being confined only to those points which are necessary to be understood in order to appreciate the reasoning employed in the subsequent pages. I have repeatedly stated, that whatever causes internal congestion, occasions also a disordered state of the respiration, imperfect chemical changes in the respiratory organs, coldness of the extremities and surface of the body, and a feeble, frequent or slow pulse.

Dr. BLACK was of opinion, that animal heat is entirely the effect of chemical action in the lungs. It was objected, however, to his

doctrine, that if such were the case, these organs would be considerably warmer than any other part of the body, or, as some have asserted, would be burnt up. This objection is, however, easily and satisfactorily obviated by the following considerations:—if the body be supposed to possess thirty pounds of blood, and the heart to transmit, at each contraction, two ounces, contracting seventy-five times per minute, we shall find that somewhat more than the whole mass will pass through the lungs once every three minutes, or twenty times per hour. Physiologists have proved, by experiment, that the blood acquires, at least, *one* degree of heat, in its passage through the lungs, and consequently, according to this moderate calculation, twenty degrees of heat will be generated every hour or two hundred and forty degrees every twelve hours. If the respiration be accelerated, and the contractions of the heart increased to a hundred, all other conditions being equal, the mass will circulate through the lungs in one-fourth of the time, and the production of animal heat will be augmented in the same proportion. The addition of *one* degree, instead of being made every three minutes, will be repeated every two minutes and a quarter. From this calcu-

lation, it appears, that the lungs may furnish a considerable quantity of heat, and yet be only one degree warmer than the rest of the body. In a congestive state of these organs, as indicated by imperfect or difficult breathing, a feeble and frequent pulse, and great susceptibility of cold, the whole of the blood does not circulate through them so frequently, in any given time, as when they are in a healthy state, and the inspired air, moreover, does not act upon it to the usual extent.

It is easy to adduce positive evidence to show, that the generation of animal heat is proportionate to the equable distribution of the blood and its accelerated circulation. Muscular exercise affords a striking illustration of the fact. If it is severe, or long continued, profuse perspiration breaks out—an unequivocal indication, that an additional quantity of heat is produced, which cannot justly be ascribed to any other causes than those which have been assigned. That the mass of blood does not circulate so often through the respiratory organs, in cases of internal congestion, as under different circumstances, appears to be directly proved by the state of the pulse, which is, during congestion, generally frequent, and re-

markably small and weak ; and, indeed, if the whole of the circulating fluid passed through the lungs in the ordinary time, *congestion could not possibly exist, for in that case, every part of the system would not only receive, but retain, its usual quantity of blood, and no more, which would evidently prevent any local accumulation of it.* Besides retarded circulation, which, in part, accounts for the diminution of temperature, the engorgement of the lungs very much circumscribes the action of the inspired air, and consequently renders it less efficient. It is not strictly the province of the physiologist to shew, in what way, heat is evolved from the combination of different gases, this being, more properly, the business of the chemist. Should it hereafter be discovered, (which does not, however, seem very probable,) that animal heat is altogether disengaged in the general capillary system, or is the production of nervous influence, the more important of the practical principles which are laid down in this Treatise, will be little affected by the circumstance, *because they are founded on conditions of the system, easily to be appreciated, which will always be found to exist in conjunction with the phenomena specified, whatever theory of animal heat be proposed for our adoption.*

An important distinction is to be made between great heat, arising *from increased production and from diminished evaporation*. Unless this distinction be kept constantly in view, we shall be liable to form incorrect notions on this subject, and, being misled by the symptoms of disease, commit gross blunders in practice. It would be wrong to conclude, simply because the patient complains of being uncomfortably warm, that there is increased production of heat. It is necessary, in order to determine this point, to consider, with great care, various co-existing symptoms.

1. Increased generation of animal heat in health is always characterised by a frequent pulse, either strong or full, by the surface of the body being warm, but not hot and dry to the touch, as in certain states of febrile diseases, or suffused with moisture; the body itself being, at the same time, less susceptible of the influence of cold.

2. In diminished generation, as in cases of simple congestion, arising from depressing emotions, or exposure to cold, the pulse is generally frequent and small, or, if slow, as it sometimes is, particularly weak; the extremi-

ties and surface of the body are cold, and occasionally there is difficult or impeded respiration.

3. Increased generation, in disease, varies in extent, according to the seat and the severity of the affection. The pulse is always frequent and pretty strong; but the degree of its strength and frequency is wholly regulated by a more or less arterialized state of the blood. The extremities and surface of the body are warm; the individual is but slightly, if at all, susceptible of the influence of cold; and the blood abstracted, under these circumstances, is more or less buffy.

4. Diminished generation, in disease, varies in extent, according to the degree and situation of the congestion. If the lungs are principally implicated, as in spasmodic asthma, or in the cold stage of intermittent fever, the pulse is small and frequent, the temperature considerably less than natural, the extremities are exceedingly cold, and the system very slowly, and with great difficulty, recovers its ordinary warmth. The blood drawn, at this time, is rarely, if ever, cupped, or buffy; and unless inflammation co-exists with the congestion, it will sometimes not even coagulate.

5. In typhoid diseases, there is always more or less of general internal congestion, and, although there is rarely increased production of animal heat, the temperature of the body is frequently augmented. In this case, the skin is hot and dry, indicating a derangement of its function—a derangement that impedes the process of evaporation, which, in health, maintains the equable temperature of the system, and, in consequence, there is an accumulation of heat. The pulse is, for the most part, frequent and weak ; sometimes, to such a degree as to render it difficult to count it. The blood abstracted seldom exhibits the buffy coat, or cupped appearance. It is highly venous in colour, coagulates slowly or imperfectly, and occasionally not at all.

6. It frequently happens that there is an increased production of animal heat, in cases of internal congestion, in which there is no evidence of the existence of inflammation, and the phenomenon is not difficult to explain. The respiratory function is excited to greater action, so that in a given time, a quantity of air is inspired, greater than what is natural, which cannot fail, although the lungs are unfavourably circumstanced for *extensive* chemical

changes, to confer additional oxygenated properties on the blood. There are perhaps thirty inspirations in a minute, in place of eighteen or twenty. The pulse is frequent, and moderately strong. The blood abstracted is occasionally slightly cupped, or buffy.

CHAP. VI.

The Function of the Sanguiferous System.

THE action of the heart is influenced by every modification, in the quality, and the quantity of the blood which it receives. The more highly it is oxygenated, the more numerous and energetic are its contractions. The more venous its nature, the weaker and, generally, the more frequent, they become. If the blood were not accelerated in its motion, when the heart, at each contraction, is sending out a much smaller quantity, than usual, the internal organs would soon be surcharged, to an extent which would render them altogether incapable of performing their respective functions. The blood is the natural stimulus of the heart, and consequently, the action of this organ will change with its varying qualities, and will, likewise, produce and maintain corresponding alterations throughout the whole of the sanguiferous system. When its contractions are frequent and strong, the vital fluid is sent, in abundance, to every part of the frame ; but when

they are frequent and almost imperceptible, from their great weakness, the extremities and surface of the body are necessarily deprived of their due proportion, and even that which they possess is inferior in quality, in consequence of which they become chilly and insensible. The heart regulates the circulation of the blood, and, as its oxygenation is proportionate to the frequency of its transmission through the lungs, that organ may be regarded as indirectly the cause of the different degrees of chemical changes of which this fluid is susceptible.

It is not necessary for the practical purposes which I have in view, to ascertain, precisely, in what way the heart is excited by its stimulus; whether by the contact of this with its internal membrane, or by the circulation of it through its muscular fibres, or, indeed, by any other cause; since the accuracy of the general observations on this subject, in reference to subsequent inquiries concerning the principles of disease, will remain, on any supposition, unaffected; nor is it, moreover, of any importance, to shew in what manner, and to what degree, the capillary system contributes to the moving powers of the blood. We may, on the present

occasion, content ourselves with stating one general and incontrovertible fact, that, whenever this fluid is highly oxygenated, the heart is excited to greater action, which, of course, promotes its more general distribution; and that, whenever it has undergone imperfect chemical changes, the character of its circulation may justly be designated *internal*. As the circulatory system is deranged, in most diseases, the necessity of thoroughly understanding its function, and the extensive influence which it exercises over the powers of life, cannot be too strongly, or, too frequently enforced.

The increased action of the heart invariably produces two effects;—*an improvement in the qualities of the blood, and a more equable distribution of it.* It is, therefore, quite evident, that whenever the sanguiferous system is particularly depressed, as in cases of internal congestion, the first object ought to be to invigorate, as directly as possible, the action of the heart, as every improvement in its function tends to relieve the surcharged organs, and to renovate the natural properties of the blood. I am persuaded, from my own investigations and reflection, that the origin and progress of

most diseases, are to be traced to causes which have disordered the circulation and qualities of the blood. In a work purely or chiefly physiological, it would be necessary, in treating of the sanguiferous system, to consider the influence of other powers supposed to promote the motion of the blood, such as the action of the capillaries, and the enlarged capacity of the chest during inspiration, which has of late excited great interest and led to the performance of many ingenious experiments. If these subjects, however, admitted of satisfactory demonstration, which in my opinion they do not, the light which they might reflect would add nothing to our knowledge of the nature and degree of those changes which the blood undergoes, in the lungs, during accelerated circulation, or the improvement it communicates to every part of the system suffering from its deteriorated qualities, or undue determination.

CHAP. VII.

*The conditions of the Sanguiferous System in
Infancy and Childhood.*

THAT a knowledge of the decided modifications produced in the distribution of the blood by various diseases, is absolutely necessary for the formation and establishment of correct practical principles in Medicine, has been shewn in the foregoing pages; and it will scarcely be doubted, that an acquaintance with other modifications, produced by nature, at different periods of life, is calculated to give to these principles a still higher degree of certainty and practical utility. The investigation of this subject will lead to the explanation of numberless phenomena that would otherwise be inexplicable, and, also suggest, or regulate, the employment of proper remedies. The distribution and properties of the blood undergo extensive changes from the early development of the powers of life, to the remote period of their natural decline, in consequence of im-

portant alterations in the structure and function of the organs employed in the production and circulation of the vital fluid. In infancy, the respiration is frequent, its two acts, expiration and inspiration, being performed, in any given time, almost twice as often as in the adult—a circumstance that cannot fail to increase, to a corresponding extent, the chemical changes in the lungs, as there is every reason to believe, that the mass of blood, in both cases, possesses the same relations to the powers which oxygenate and propel it.

As the functions of respiration, in health, cannot be increased without producing additional chemical modifications in the blood, it may be regarded as an established fact, that this fluid is more completely oxygenated in infancy and childhood, than at any other period of life. It is admitted that the contractions of the heart are more frequent and vigorous, when the blood in the lungs undergoes extensive changes, than when that action is incomplete : to what cause, then, can we attribute the frequent contractions of the heart in infancy and childhood, *if not to the more highly oxygenated condition of the blood?* These contractions may perhaps be supposed to arise from the heart

being, in early life, more irritable, or, in other words, more easily excited by the circulating fluid, than at a later period, but this is a mere supposition. It is not, however, absolutely necessary to shew that the action of this organ is accelerated by the stimulating qualities of the blood, in order to prove that this fluid is endowed with greater vital properties, in the earlier periods of life, than subsequently, since other striking circumstances may be adduced as evidence in corroboration of this opinion; and it may here be observed, that the admitted fact of the more frequent action of the heart, in infancy and childhood, goes far towards establishing the highly oxygenated condition of the blood; for the accelerated and vigorous contractions of this organ, necessarily cause the mass of this fluid to pass, in a given time, more frequently, through the lungs, in early, than in advanced life, and hence its appearance will be more florid, in the one instance, than in the other.

The difference in the colour of the blood drawn from the veins, at different ages, is indeed scarcely less striking than that which exists between the colour of the venous and that of the arterial fluid, in the same individual: this ex-

traordinary difference cannot be justly ascribed to any other cause than its greater or less degree of oxygenation. In every instance in which the blood is more than usually florid, whether that appearance be observed after the excitation of exercise, or during the existence of disease, or under the operation of stimulants, it is easy to shew that this heightened colour arises from extensive chemical changes in the lungs ; and, moreover, that these changes, whenever the blood is blacker than natural, coagulating with difficulty, or perhaps not at all, are proportionately defective. In the former case, the contractions of the heart are frequent and strong ; in the latter, generally frequent, but always feeble. These facts render it probable, that the blood, in infancy and childhood, is possessed of more perfectly oxygenated properties than at a more advanced age, and as animal heat is derived from changes produced in the qualities of the vital fluid in the lungs, there would appear some reason for supposing that its temperature also, is higher, in the earlier, than in the later periods of life : yet, from numerous experiments performed, for the direct purpose of determining this interesting point, it did not appear that there was any decided difference, between the temperature of infants and adults,

that of the former being found, in many instances, three or four degrees *above*, and, in many, *beneath* that of the latter, so that the medium temperature of the same number of infants and adults, was pretty nearly alike, the advantage being, only slightly, in favour of the former. This circumstance, however, is far from subverting the argument advanced to prove, that the extent of the chemical changes in the lungs is different at different ages; because the increase in the generation of animal heat, in infancy and childhood, *may excite a proportionate degree of activity, in certain functions, which tend, either directly or indirectly, to dissipate it; and, in that case, the thermometer would not indicate any very perceptible augmentation, even though the chemical changes in the lungs, were considerably greater than at a later period of life.* In diseases of a purely inflammatory kind, the temperature is, sometimes, several degrees higher than is natural; but this may, perhaps, occasionally, be attributed, with as much probability, to diminished evaporation, as to increased generation of heat; and it seems strongly corroborative of this opinion, that the surface of the body, in such diseases, is, for the most part, dry and disagreeably hot: when, however, it is abundantly suffused with per-

spiration, the temperature is rarely much above its ordinary degree.

It has been already stated, that an increased activity of the respiratory organs is necessarily productive of corresponding modifications in the properties of the blood; that the contractions of the heart are rendered more frequent and vigorous in consequence of its more stimulating qualities; and that these accelerated contractions are quite sufficient to account for the striking alterations produced in the condition of the circulating fluid. The easy explanation of many interesting phenomena, in the application of these principles to the animal economy, furnishes strong presumptive evidence in favour of their general correctness. The invigorated action of the heart, occasions an equable diffusion of the blood through all parts of the frame: hence the extremities and surface of the body are warmer in early, than in advanced life. This difference, in the distribution of the vital fluid, will enable the physiologist to explain *the cause of young animals being particularly susceptible of cold, and of a more speedy restoration of the temperature, after it has been greatly reduced in them, on the employment of proper means, than in adults.* Dr. EDWARDS, of Paris, who has paid

great attention to this subject, endeavours to prove, by numerous experiments, that this greater susceptibility of the young to the influence of cold, *arises from their very limited power of generating animal heat*. The evidence, however, which he adduces in support of this opinion, is not satisfactory, and there is no necessity to have recourse to it, in order to account for an increased susceptibility, which is easily explained by the condition of the sanguiferous system in early life. I have ascertained, by repeated experiments, that the facility with which the young are both cooled and warmed, *depends entirely on the character of the existing circulation, and not on any difference in the power of producing heat*.

It is not necessary here to detail these experiments, and the train of reasoning which accompanies them, as they are stated, at considerable length, in the “*Experimental Inquiry* :” and I merely allude to them as strongly corroborating the opinion, that the blood, in infancy and childhood, is more completely oxygenated, and more equally distributed throughout the body, than in advanced years. It has long been an established fact in physiology, that the arterial system in the

young has, apparently, a decided predominance over the venous, and that this, in the aged, has a similar superiority over the arterial. Physiologists have attempted to account for these modifications of the sanguiferous system, by supposing that a natural change takes place, in the veins and the arteries, at the two different periods of life, by which, the circulation of the blood is thus powerfully influenced. “ This view of the subject was adopted by CULLEN, who, according to his usual custom, has compressed into a short compass an elegant summary of his doctrine. He proceeds upon the three principles, *that there is a different distribution of the blood in the different periods of life, that the vessels offer a greater resistance to the entrance and transmission of the fluids, as age advances, and that the excitability of the system is gradually diminished.* In youth, the quantity of blood is the most considerable ; the arterial system is always in a state of over-distension, and, from the greater *contractility* and *sensibility* of the system, has a tendency to increased action. On this depends the growth of the body ; the functions are all in an active state, a large quantity of blood is formed, and this is deposited, by the arteries, in the different glands, or organs of secretion, from which the mate-

rials of the body are composed. This addition of new matter, and the force of the circulation distend the different parts, and add to their bulk. After some time, the addition of matter, and the degree of extension, resist the further continuance of the process, and the power of the arteries is so balanced to the condition of the system as to enable it to retain its present state. But this balance is soon destroyed, by the diminished action, both of the muscular fibre and of the nervous matter, in consequence, partly, of the decline of their powers, and partly from the diminution in the quantity of arterial blood that is sent to them. At the same time the veins being more *distensible* than the arteries, and having experienced less alteration in their texture, and partaking, also, less of the vital actions of the system, the blood is more disposed to accumulate in them. There are many facts in pathology which appear to countenance CULLEN'S hypothesis of the arterial plethora in youth, and the venous plethora in old age, and it seems likewise to coincide with the state of things, which might be expected to ensue, from the actions of a system so arranged and so organized. From calculations that have been made, combined with anatomical observations, it is found that the

growth of the heart does not keep pace with that of the sanguiferous system generally,* while, at the same time, we learn from the Experiments of WINTERINGHAM, that the arteries become firmer, and would, consequently, require a greater force to preserve them in the same state of distension. The veins, being the less active part of the circulating system, and being chiefly of use, as reservoirs to contain the blood and suffer it to return to the heart, after it has performed all its functions, and is reduced to what may be regarded as an inert state, thus become surcharged with blood, and it appears, as a matter of fact, that their relative capacity is increased."†

It is evident from this extract, that a greater degree of influence is attributed to the venous and arterial systems, than we have reason to suppose they exercise. The principles I have stated, are amply sufficient to elucidate the phenomena in question, without any unfounded assumptions. The arteries and veins, like every other part of the animal system, are undoubtedly susceptible of great changes, but

* Cullen's Physiology. § 298, p. 249.

† An Elementary System of Physiology. By JOHN BOSTOCK, M.D., F.R.S., &c. Vol. III. 338.

these ought not to be considered so much *the causes of the modifications in the distribution of the blood, as the consequences of natural alterations in the tone and vigour of the system generally, with the exact nature of which, we are but imperfectly acquainted.* It has been stated in the foregoing pages, that in early life the functions of respiration are very active, and give rise to highly oxygenated properties of blood,—circumstances alone sufficient to explain the peculiarities in the circulatory system of the young. The heart and arteries are vigorously excited by the vital fluid; the veins are also similarly excited; and it cannot possibly be otherwise, because the blood which increases the action of one system of vessels will necessarily influence, in the same proportion, that of another. The decline of the powers of life is a subject to which I shall briefly allude, in the next Chapter, the investigation of which will tend to establish the accuracy of the principles, only slightly touched upon in this; and still further evidence, in confirmation of the same, will be adduced, throughout this Treatise. An examination of the diseases peculiar to the two extreme periods of life, would strengthen the argument brought forward in this inquiry; for, though some of them may

be supposed to arise from a predominance of the arterial or venous system, in early and advanced life, and may therefore be imagined to prove the correctness of the opinion expressed in the preceding extract, it would, nevertheless, not be difficult to shew, that such morbid phenomena are, by no means, opposed to the principles here laid down. Both systems must, indeed, at every period of life, exhibit the same general condition, because they are both equally influenced by the qualities of the circulating fluid, whatever be the degree of its oxygenation.

CHAP. VIII.

*The conditions of the Sanguiferous System, in
Old Age.*

IN early life, the animal system is vigorous, in order to develope and establish its numerous powers, which, if uninterrupted by injurious circumstances, continue for a series of years, regularly and efficiently, to perform their respective offices. It is, perhaps, impossible to ascertain the precise changes which time, or disease, induces in the organization of the the body, so as to occasion permanent modifications in its various functions; but it is not difficult to acquire general ideas on this subject, nor to describe, with accuracy and perspicuity, sufficient for all practical purposes, the prevailing condition of the system, in the decline of life. The nature and characteristic phenomena of this condition admit of but little difference of opinion, whatever variety of sentiment may exist, as to the manner of its production. The vital powers, from the earliest period of existence, are continually liable

to be disturbed by various circumstances, such as the vicissitudes of the seasons—the injurious influence of disease and evil habits, as well as the undue excitement or depression of mind. Whether the disturbance be slight or severe, of short, or of long duration, a derangement, in the distribution and properties of the blood, is an inevitable consequence. It may, perhaps, be considered scarcely correct, to assert, that, after every such disorder of the circulatory system, the numerous capillaries of the body are either generally, or partially, so deranged, as to be rendered incapable of efficiently performing their several functions. The structural modifications produced by disorder in the circulation, may, indeed, be too slight to be detected by the closest examination, and the health may not be affected by them, in any perceptible degree, even whilst such modifications really exist, though they may not be discovered till after many successive derangements, when disease of the more important organs, becomes, at length, no longer questionable. The chylopoietic viscera may have been disordered many times, by depressing emotions, by ordinary colds, and by imperfect digestion; yet their several functions continue, for a series of years unimpaired, but

the absence of symptoms, unequivocally characteristic of organic changes, cannot be adduced as evidence to prove, that the capillaries have not undergone the alleged modifications. Nature has not indeed been so niggardly, in bestowing the various powers of the animal economy, that a subtraction of a part of them, necessarily and directly interrupts the operations essential to health : she has, on the contrary, been truly liberal in their distribution, and if she had been less bountiful, as the system is continually liable to be influenced by circumstances which diminish its natural energies, it is reasonable to infer, that existence, at least pleasurable existence, would rarely have been prolonged to an advanced period. It is indeed acknowledged by pathologists, that the structure of the lungs is very different, in youth and in old age—a fact strongly corroborative of this opinion. “*En examinant les cellules du poumon,*” observes Magendie, “*j’ai été frappé de la variation de grandeur qu’elles éprouvent par les progres de l’âge ; leur nombre est en raison inverse des années. Il resulte de ce fait que notre poumon doit acquerir, á mesure que nous vieillissons, une légèreté spécifique très grande.*”*

* *Journal de Physiologie Experimentale*, Par. F. MAGENDIE. No. IV. October, 1821, p. 80.

Every part of the animal machine is similarly circumstanced to the lungs, as it is regulated by the same general laws, and influenced by the same general causes. Though the numerous organs may, individually, possess a peculiar structure, and each exercise a distinct function, they nevertheless bear a striking resemblance to each other, in having one property common to all of them—*they are, almost entirely, composed of capillaries, and it is, consequently, probable, that in advanced life, these vessels are generally in a similar morbid condition.* Permanent changes in them are the effects of causes which have disturbed the healthy and harmonious action of the vital powers—effects, which are themselves rapidly converted into causes, tending gradually to accelerate the progress of that state of the system, characteristic of old age. If the vascularity of the lungs be diminished in advanced life, from the obliteration of a portion of their vessels, it is quite clear, that they are not then so well calculated to expose the sanguineous fluid to the influence of the inspired air, as in infancy and childhood, when these vessels are much more numerous and healthily constituted; hence, the blood in old age, partly in consequence of this circumstance, will, in the greater

number of instances, be destitute of highly nourishing and stimulating properties.

The distribution of blood, though but little deficient in its ordinary qualities, is injurious to the system, because it fails to excite, as usual, the numerous capillaries of the body, and consequently, leads to the production of morbid effects in the capillaries, which, in their turn, act as causes deteriorating still further the vital condition of the circulating fluid. In old age, the pulse is generally slow, or if frequent, it is feeble ; the surface of the body is shrivelled, or exsanguineous in appearance ; the temperature is easily reduced, the extremities are mostly cold, and the blood drawn from a vein, is far from possessing that rich and florid character, which it invariably displays, in the full exercise of the vital powers. This description does not, of course, aptly apply to all, in advanced life, but to such only as exhibit some of the manifestations of decay, which are here enumerated. As the blood is defective in its usual stimulating properties, the heart is but slightly excited, in consequence of which, the pulse is necessarily slow or feeble, the extremities cold, and the heat of the body easily reduced, on exposure to a low temperature.

These various phenomena arise from causes which have gradually lessened the vigorous action of those functions, whose office it is, to produce and distribute the vital fluid, and not, as generally taught by physiologists, from primary alterations in the constitution of the arteries and veins—alterations by which the circulation of the blood is considerably modified, at the two extreme periods of life. Though some may, perhaps, doubt the accuracy of these views, and the justness of their application, it will not, for a moment, be contended, that the blood of the old and emaciated is possessed of the same stimulating and nourishing properties as that of the young and robust, in whom every part of the animal frame displays an exuberance of vital energy, and, hence effects, characteristic of vigour or debility, will necessarily be produced in both cases throughout the system. The gradual and natural decay of the powers of life, then, is to be accounted for, on the established fact, that the capillaries are liable to be disturbed in their function, by the numerous and unavoidable modifications to which the animal economy is subject, during an extended course of existence, by which modifications, the vessels are, at last, either partially, or generally obliterated.

It is not necessary to describe, in detail, the different steps in the process of disorganization—the continual conversion of effects into causes, and the manner in which these causes individually operate, so as to occasion the naturally morbid phenomena of old age; for these subjects can scarcely fail to be understood from the observations already made, or from others, that will be offered, in the course of this Inquiry, in treating of the capillary system generally, or any of its various subdivisions.

CHAP. IX.

The influence of Exercise on the Sanguiferous System and the Powers of Life.

IT is clear, that exercise is not only conducive to health, but indispensably necessary to its continuance. The exact mode in which it communicates its extensive and grateful influence, to every part of the animal economy, has never been satisfactorily explained, nor was it, indeed, possible to explain it, whilst physiologists were unacquainted with the important laws of animal heat, because a knowledge of them is necessary to understand the operation of muscular exercise, on the moving powers of the sanguineous fluid, and the changes effected by such exercise, in its properties. Exercise, whether gentle, or severe, accelerates the circulation, so that the mass of blood, contained in the body, passes, in any given time, more frequently through the lungs, than during an unexcited state of the system, and receives a proportionate increase of vital energy. This is

one important and manifest modification, produced by exercise, in common with every cause that occasions an invigorated motion of the blood ; but there may be other changes besides those purely chemical, by which the qualities of this fluid may be considerably improved.

Exercise, by agitating the body, directly influences the functions of the abdominal organs, in consequence of which, their several secretions are poured out more abundantly, and with greater regularity, than usual—an effect which may be considered, in some degree, though not entirely, independent of the chemical changes induced in the blood ; for, as soon as the circulating fluid has acquired additional stimulating qualities, and is propelled by the heart with increased vigour, the chylopoietic viscera, generally, are excited to greater action, and this effect continues, long after the cessation of the cause which, in the first place, produced it. The blood is not only improved in its chemical properties by passing through the lungs more frequently than usual, but it also acquires additional nourishing qualities from the more abundant and healthy contributions furnished by the digestive apparatus. That the chemical changes in the

lungs are increased by exercise, of every kind, is a fact admitting of direct proof.

The florid appearance of the surface of the body, and the additional warmth of the extremities, are circumstances strongly corroborative of the fact, but there are others, much less equivocal—such as an augmented temperature of the body—a copious flow of perspiration—a strong and frequent pulse, and a buffy condition of the blood. It is shewn, in the “Experimental Inquiry,” that, whenever the sanguiferous system is particularly excited, whether by inflammatory diseases, external and internal stimulants or moderate exercise, the blood, almost invariably, exhibits, on coagulation, a buffy appearance, which indisputably arises from extensive chemical changes in the lungs, because that appearance is observed, only *when it is easy to prove that such changes are greater than usual*. Nature has apparently been very solicitous to secure considerable activity of the sanguiferous system in early life, when it is highly essential that the vital powers should possess more than ordinary vigour, in order to supply the extensive wants of the body, occasioned by its growth. All young animals are playful. They have a constant tendency

to indulge in sports that exercise, more or less, the whole system, and consequently maintain, in energetic action, the various functions of organic and animal life. When, however, exercise is continued sufficiently long to occasion great fatigue, the properties of the blood are deteriorated, and sometimes to such a degree, that it does not coagulate when drawn from a vein. Moderate exercise is productive of additional vital properties, but, when excessive, it lessens those properties. An excited condition of the system not only tends to invigorate the powers of life, as explained in the preceding pages, *but also to exhaust them, by accelerating the expenditure of the nourishing properties of the blood, an effect necessarily produced by augmenting the different excretions of the body, so that if exercise is severe, this expenditure being proportionably great, the circulating fluid is at last deprived of those properties which enable it to perform its numerous and important offices.* The chemical changes in the lungs may be considered as rendering the blood nutritious, by imparting to it oxygen, and extracting from it carbon, but, if it has become exceedingly impoverished, from abundant excretions, the inspired air will not modify it to the usual extent, or in other words, *will be incapable of*

supplying the vital properties which have been gradually dissipated by the inordinate activity of the excretory functions. It is, moreover, probable that, under these circumstances, the distribution, as well as the qualities of the blood, is very much disordered, so that this fluid may be unfavourably situated in the lungs for proper chemical action, which will, also, in part, explain the cause of its deterioration.

CHAP. X.

The Influence of Electricity and Galvanism on the Powers of Life.

A DISTINGUISHED philosopher has remarked, that “to discover truth is to do good on a great scale.” The truth of this observation is forcibly illustrated by the various discoveries that have been made, both in physical and moral science. An important fact, which, on its first enunciation, may, perhaps, excite very little attention, or may not be thought of any practical value, may ultimately be found to possess the most intimate and extensive relations to the several departments of philosophical inquiry. The discovery of galvanism affords a striking illustration of this remark. Its application to chemistry has been followed by the most extraordinary and beneficial results, and its employment in cases of disease, may be succeeded by effects no less striking and salutary, when the nature of its action is clearly ascertained, and those morbid conditions of the animal system pointed out, in the

treatment of which, it is unquestionably calculated to be of service.

No enlarged and satisfactory views have hitherto been given, respecting either the mode in which galvanism acts, or the character of those morbid conditions in which its employment is calculated to be serviceable; the investigation of these subjects here is, therefore, highly important. WILSON PHILIP has frequently applied galvanism to relieve the disorders of the human frame; but a close examination of his experiments, and of the diseases in which it was used, will show, that he had no clear perception of the manner in which it affects the vital powers, or of those conditions of the system, in which its employment is likely to be beneficial. Galvanic agency is considered by him as similar, in nature, to nervous influence, and, on this supposed similarity, he has attempted to explain the different phenomena. As the difficulty of breathing, and all severe symptoms occurring on the division of the eighth pair of nerves, were, in some instances, entirely removed by the continued application of galvanism, he inferred from this circumstance, but certainly without sufficient

reason, that the nature of the galvanic and of the nervous fluid was the same. Had his mind been less biassed by the opinion he entertained concerning the influence of the nervous system on the process of digestion, he would have formed much juster views respecting the action of galvanism on the human frame. Believing that the cessation of digestion, on the division of this pair of nerves, arises solely from the withdrawal of the nervous fluid from the stomach, he naturally concluded, that, as galvanism re-established, to a considerable extent, the powers of the disordered function, the nature of both agents is the same. A similarity in the effects produced, does not, however, warrant such a conclusion. It is shown, in the “Experimental Inquiry,” that the division of the nerves produces derangements, not only in the functions of digestion, but in many others, *in consequence of the impediments it occasions to the ingress of atmospheric air, the absence of which, in sufficient quantity, causes serious interruption of the chemical changes of the blood in the lungs: and it is easy to prove, that galvanism, employed under such circumstances, removes the severe derangements, by relieving the congestion of the lungs and*

contiguous viscera, and not by transmitting to the stomach, or to any other organ, a fluid analogous, in any of its properties, to the nervous.

It is indeed satisfactorily shown by WILSON PHILIP'S own experiments and observations, that the beneficial influence of galvanism, may be justly accounted for in this way, for, whenever its application was discontinued, for a short time only, in any of his experiments, the respiration became very laborious, and the sufferings of the animal acute—effects entirely attributable to the accumulation of blood in the lungs. In those instances, in which galvanism was not at all employed, the lungs were found, on dissection, considerably larger than their natural size, and, in appearance, exactly like the liver; but in those cases, on the contrary, in which it had been applied, and with its usual success, these organs were observed, after death, to be comparatively healthy. We do not possess any means, whatever, of ascertaining the exact influence exercised by the nervous system, in the process of digestion or assimilation, as it is not in our power to mutilate any part of this system, so as to arrive directly at such knowledge, without, at the same time, causing considerable mo-

difications in the general conditions of the organs, which are the subject of experiment, and hence, it would be highly unphilosophical to draw positive conclusions from the appearance of them, after any such experiment. The evidence generally adduced, in corroboration of the particular views entertained respecting the action of the nervous system, in the mysterious operations of the animal economy, is certainly weak, compared with that which can be advanced in explanation of the functions of the sanguiferous system ; although, it is not, in either case, possible to discover how the phenomena of life are accomplished. It is an acknowledged fact, that nerves in general, with the exception of those belonging to the senses, are endowed either with a motory or a sensitive property, which is, indeed, bestowed on every part of the body, in proportions, varying according to the character of its functions : but our knowledge of the nervous system extends no further, and when it is proposed to ascertain in what manner this system effects secretion, absorption, or assimilation, there are no established data to direct the investigation. If it were possible to show, that the function of an organ is invariably disordered, when the nerve, distributed to it, is

injured or diseased, it would then, indeed, be a legitimate inference, that some necessary connexion exists, between the healthy action of the organ, and the normal condition of the nerve, and this inference would be, as conclusive as that in favour of the connexion existing between the sanguiferous system and any of the functions of the body. As our knowledge of the influence exercised by the nervous system, is thus bounded and imperfect, it is clear, that WILSON PHILIP, in attempting to prove that the galvanic and nervous fluid is the same, in nature, or in action, neglected to ascertain one important point, without a knowledge of which, a comparison cannot be instituted between them—*the degree of dependence of the organic functions on the nervous system.*

If it can be satisfactorily shown, that digestion, for example, is entirely regulated by the quantity and quality of blood transmitted to the stomach, and not, by the more, or less copious flow of nervous fluid to it, it is evident, that the view we take of the operation of galvanism on the division of the eighth pair of nerves, or in cases of disease, will be very different from that of WILSON PHILIP. Our knowledge of the functions of the sanguiferous

system is sufficiently extensive and accurate for any of the practical purposes of this investigation. We are fully aware that it is susceptible of great changes—at one time being highly excited, at another, equally depressed, and, moreover, that the functions of organic life are affected by every such change. Galvanism and electricity are both stimulants, and, from any thing we know to the contrary, exert a similar influence on the vital powers. They have, occasionally, been employed, with benefit, in diseases characterised by loss of motion and sensibility, and hence, it has been inferred, that they act chiefly, on the nervous system. It is, however, equally manifest, that the motion of the blood is accelerated by them, though it is difficult to explain in what way this effect is produced; whether it arise from a primary affection of the nerves communicated to the circulatory apparatus, in consequence of which, the contractions of the heart and capillaries are rendered more frequent and vigorous, or from the direct influence of galvanic and electric agency on the contractile fibres, of which these organs are principally composed, or, from an important modification, which may be supposed (and there is no absurdity in the supposition) to be caused by

that influence in the vital fluid itself, whereby its motion is accelerated.

As it is not possible, in the present state of physiological science, to determine this question, we may rest satisfied with the established fact, which is amply sufficient for any practical inquiries,—viz. *that the sanguiferous system is very much excited by galvanic and electric influence.* When the former has been employed on rabbits, on the division of the eighth pair of nerves, it has sometimes produced a decidedly inflammatory appearance of the organs in the vicinity of which it was applied, an effect, from which it may be inferred, that the action of the capillaries was increased by it. WILSON PHILIP has frequently found its application of great service in cases of habitual asthma, and there cannot, I think, be any doubt, that it will, occasionally, be of the greatest advantage, when applied to the cure of diseases characterised by an *internal* circulation.

It is not necessary, in this place, to give a particular enumeration of diseases of this kind. The greater part of those affections, almost peculiar to females, which are generally desig-

nated nervous, may be mentioned, as cases likely to be greatly benefited, by the proper application of galvanism or electricity, for they are unquestionably characterised by those conditions of the sanguiferous system, in the treatment of which, stimulants, as one part of practice, are strongly required. The term nervous, is so indefinite, that it is necessary, in order to give greater precision to it, to detail a few of the symptoms, with which, an irritable and nervous state of the mind frequently co-exists. Shortness of breath, or hurried respiration, on slight exertion, cough, occasional palpitation of the heart, cold extremities, a small and feeble pulse, and diminution in the generation of animal heat, are a few of the co-existing symptoms. The severe forms of cholera, in which the thoracic organs are exceedingly oppressed, by the determination of blood to them, may, also, be here mentioned, as morbid conditions of the system, likely to be relieved by galvanic and electric agents. It is of great importance, to know at what part of the body to apply them, so as to produce the best results. Now, if we consider that the heart regulates the circulation of the blood, the vicinity of this organ will immediately suggest itself, as the proper situation for their application, since

it is not possible to invigorate its contractions, without exciting, at the same time, a similar action throughout the sanguiferous system, and consequently, producing the better oxygenation and more equal distribution of the vital fluid, as well as numberless other good effects, directly flowing from these general improvements. The various circumstances, in which galvanism and electricity are calculated to exercise a beneficial influence, will not be clearly understood, until the class of congestive diseases has been minutely considered, a subject on which I shall enter in a subsequent work.

CHAP. XI.

The Influence of Heat on the Distribution and the Qualities of the Blood.

THE seasons and their vicissitudes are continually inducing new actions in the living system, which constitute disease, or which render the body highly susceptible of causes that produce it: the extensive influence they exercise, has been remarked and alluded to in all ages. Many absurd and ridiculous ideas have been formed on the subject, which, however, cannot be a matter of surprise, if we consider that the laws of the animal economy were, scarcely at all understood in very remote times, and, even in the present day, are too imperfectly known to admit of enlarged and correct views. The truth of these observations might be easily proved by numberless authorities from HIPPOCRATES to Dr. EDWARDS, a truly enlightened physiologist.* CELSUS, who abounds

* La température du corps dépendra de la chaleur produite et de la chaleur communiquée. Leur proportion respective pourra varier

more in facts, than in theories, states, in several places of his valuable work, the diseases peculiar to different seasons ; but with that sobriety of judgment, which so particularly characterises his inquiries, hesitates in proposing any explanation of the phenomena. Igitur saluberrimum ver est : proxima deindè ab hoc, hiems : periculosior æstas, autumnus longè periculosissimus. Ex tempestatibus verò optimæ æquales sunt, sive frigidæ, sive calidæ : pessimæ, quæ maximè variant, quo fit ut autumnus plurimos opprimat. Nam ferè meri-

sans que la température du corps varie. Il y aura ainsi compensation entre la chaleur qui vient du dehors et celle qui se développe à l'intérieur ; l'excès de l'une suppléera au défaut de l'autre. Mais l'économie n'acquiert cette faculté de s'accommoder à la température extérieure qu'avec la marche lente et progressive des saisons : du moins elle ne l'acquiert au plus haut degré que par ce moyen.

Si en été il survenait un froid subit aussi vif que celui que nous pouvons supporter en hiver, le corps serait, pour ainsi dire, pris au dépourvu ; la faculté de produire de la chaleur étant alors réduite à son moindre degré, celle qui est enlevée ne serait plus suffisamment réparée. A cet égard, nous differons de nous-mêmes en été et en hiver de la même manière, mais à un moindre degré, que les jeunes animaux à sang chaud diffèrent des adultes. Si les premiers résistent moins au froid, c'est qu'ils ne peuvent pas développer, autant de chaleur. Chez eux, cette faculté s'accroît sous l'influence de température douce, par les progrès de l'organisation : chez les adultes, par l'impression ménagée du froid dans des degrés et des durées appropriées à leur être.—*Del' Influence des agents physiques sur la vie. P. 256. Paris, 1824.*

The same train of reasoning is pursued in many other parts of his work. It is quite evident from this quotation, that he had no just

dianis temporibus calor ; nocturnis atque matutinis, simulque etiam vespertinis, frigus est. Corpus ergo, et æstate, et subindè meridianis caloribus relaxatum, subito frigore, excipitur.* Summer produces an excited state of the system, which predisposes it to affections, different either in nature, degree of severity, or frequency of occurrence, from those of winter. To endeavour to ascertain the cause of this, is not only an interesting, but an important investigation.

idea concerning the operation of heat. The great susceptibility of young animals, and of the body, in summer, to the influence of cold, is here stated to arise from a diminution in the generation of animal heat. I have ascertained, by multiplied experiments, that young animals possess an equal, if not superior degree of temperature, and from the principles partially developed in this work, and more fully in the "Experimental Inquiry," it can scarcely be called in question, that when the system is excited, either by internal or external stimulants, as for example, in summer, when the body is suffused with moisture, on the slightest exertion, the production of animal heat is greater, than when the vital powers display less energy. The phenomena, which he explains agreeably to his own views, are more satisfactorily accounted for by the great difference in the distribution of the blood in an excited and an unexcited condition of the system. In early life, and in summer, the circulation is rather *external* than *internal*, or, in other words, the blood is transmitted, in abundance, to the extremities and surface of the body, in consequence of which, a greater quantity will be influenced, in any given time, by the sudden application of cold, and the internal organs will, thereby, be subject to great derangement.

* Lib. II., Sec. I.

The influence of heat is chiefly, if not altogether, confined *to the production of highly oxygenated blood*. The circulation on the surface of the body is invigorated, or enfeebled, according to the temperature to which it is exposed. In winter the superficial capillaries are constricted, or, at least, blood is less abundantly distributed to them, in consequence of which, the internal organs are slightly congested, and are, thereby, less favourably situated for the production of animal heat. In summer, these vessels are stimulated to increased activity, which, by withdrawing the blood from within, promotes its more perfect chemical changes in the lungs. It would be no difficult matter, to adduce evidence, to shew that, at this season, the sanguiferous system is particularly excited, and that the circulating fluid undergoes extensive modifications. The first of these facts is proved by a greater frequency and strength of pulse, and a more equable distribution of blood, as indicated by the general diffusion of heat, and the glowing appearance of the body : the second, by the almost continual existence of sensible perspiration, and the facility with which it is occasioned, on slight exertion. Whenever the generation of animal heat is augmented, whether by inter-

nal, or external stimulants, or by muscular action, its superabundance is thrown off, by a proportional increase in the secretory functions of the skin. This fact alone clearly proves, that the respiratory organs have effected considerable alterations. Bodily exercise, exhilarating states of mind, internal and external stimulants, and emetics, are calculated to excite an equable distribution of blood, *and consequently, to promote its more complete oxygenation.* The heat of summer does not, then, influence the circulatory system in a mysterious, or peculiar manner. Its effects are not attributable to any properties which it directly imparts to the blood, *but to modifications in its distribution.* The same general effects are produced by other means, which differ widely, both in their nature and mode of action. Internal stimulants accelerate the contractions of the heart, and thus, speedily establish a vigorous circulation, which, by causing the mass of blood to pass more frequently than usual, in a given time, through the lungs, necessarily gives rise to proportionately rapid chemical changes. Exercise is productive of the same effect, but the improvement in the circulation succeeding it, is not the cause, but the consequence, of the more

equable diffusion of the blood. If these principles are correct, it can no longer be a matter of doubt in what way the heat of summer influences the properties and motion of the sanguineous fluid.

CHAP. XII.

The Influence of Cold on the Distribution and Qualities of the Blood.

I HAVE endeavoured to shew, in the preceding Chapter, that the heat of summer influences the temperature of the body, and the qualities of the blood, by promoting its more general diffusion. It is now my object to shew, that the agency of cold occasions contrary effects, not because it exerts any mysterious or extraordinary power, but simply because it enfeebles the circulation on the surface of the body, and, consequently leads to internal congestion. It is difficult to preserve an agreeable degree of warmth in winter, without the aid of exercise, or additional clothing. The former improves the qualities and distribution of the blood by facilitating its motion; the latter maintains the proper action of the superficial capillaries, and in this way operates beneficially on the conditions of the whole circulatory system. Cold, if severe or long continued, constricts these vessels and prevents

them from receiving their usual quantity of blood, so that an undue proportion is thereby determined to the thoracic and abdominal viscera. Two causes are then in operation, which account for the ex-sanguineous appearance of the body, and its great chilliness : *the action of cold, and the deteriorated qualities of blood.* The former does not allow the circulating fluid to flow with its ordinary facility to the surface and extremities, and the latter, from not stimulating the heart to vigorous action, considerably circumscribes its distribution. *Cold acts with different degrees of severity on the system, according to the character of the circulation existing at the time.*

Some persons are, from natural constitution, highly susceptible of cold, while others are scarcely at all. The cause of such striking differences has never been satisfactorily explained. When the system is particularly delicate, the nourishing and oxygenated properties of the blood are not sufficiently invigorating to excite a strong and healthy action in the capillaries belonging to the extremities and surface of the body, and external cold will very readily depress them, and thus necessarily subvert the balance of the circulation, and place the

lungs in circumstances unfavourable to the regular exercise of their functions.

That this view is correct, may be easily proved, by taking into consideration the degree of susceptibility co-existing with the various modifications of the circulatory system. Persons of the sanguineous temperament, who live generously, and who are frequently impelled, by strong and lively feelings, to active exertion, bear cold much better than others of a melancholic temperament, whose fastidious appetite, pallid and dejected countenance, small and feeble pulse, and cold extremities, clearly indicate the want of energy in the circulation. It will scarcely be disputed that, in the former, the blood is better calculated to strengthen and stimulate the powers of life than in the latter, because food of every description is better digested and assimilated, and the numerous animal and organic functions are, therefore, more energetically performed. To admit the existence of these conditions, and yet deny the reasoning founded upon them, would certainly be unphilosophical. When the blood is endowed with highly vital properties, the superficial capillaries are, necessarily, excited, and the proportion of it,

which they receive, is more frequently renewed than when they are particularly depressed by internal or external causes. On this principle, it is easy to account for the different degrees of susceptibility of cold which exist amongst mankind,—*the susceptibility being principally regulated by the quantity of blood circulating, at any one moment, on the surface of the body.* An increased quantity, necessarily, supposes more stimulating properties, and a more vigorous circulation.

In all acute inflammations, characterised by augmentation in the generation of animal heat and the more general diffusion of blood, the body is not unpleasantly affected by the agency of cold, but this is frequently even sought for the grateful influence it confers; and, in all excitements of the system, by mental or corporeal stimulants, cold is borne for a time, without any inconvenience; whilst a state of depression, however produced, providing the natural sensibility of the brain remain, never fails to render the susceptibility of the frame to cold more acute. The same phenomenon is generally observed in nervous patients, who have a weak and quick, or slow and feeble pulse, an unhealthy appearance of the

skin, and an imperfect digestion, being at the same time afflicted with despondency of mind. In patients of this description, the blood does not possess its ordinary stimulating and nourishing properties, and its circulation, consequently, becomes rather *internal* than *external*. When exercise has been continued long enough to occasion fatigue, a similar degree of susceptibility is produced, arising from the deteriorated qualities of the circulating fluid, caused by perspiration and other excrementitious functions, whose only source is the blood, which, when thus exhausted, gradually fails to stimulate with sufficient vigour the capillary vessels on the surface of the body. The debility succeeding mental anxiety, arises, in part, from a diminution in the quantity of food received, or, from its imperfect changes in the chylopoietic viscera. All young animals are much more readily both cooled and warmed than adults. The blood in the former, is distributed in greater proportional quantity to the surface of the body, being naturally possessed of more stimulating qualities: it might therefore be imagined, that the young would, on this account, be less susceptible of cold, but they are not. In explanation of this fact, two causes may be assigned; first, that animals,

like inanimate bodies, of the same kind, differ in their rate of cooling, according to their size; and, secondly, that, *in the young, the capillaries on the surface of the body are particularly minute and numerous, so that the blood is divided into very small portions, a circumstance which will manifestly render it more liable to be acted upon by external agents. Cold will as easily depress its motion, as heat will quickly restore it. The temperature of both young and old will be influenced according as the mass of blood is affected in its circulation, and the facility with which this is accomplished depends on the extent and vascularity of the surface exposed.*

The superficial capillaries receiving a greater proportional quantity of blood in the young than in adults, heat, in whatever way applied, will more readily excite the sanguiferous system of the former than of the latter, because the whole of the circulating fluid is more easily affected by it. Exercise, as well as internal and external stimulants, by giving to the blood on the surface of the body an accelerated and vigorous motion, renders the system, for a time, less susceptible of cold. A slight application of it is insufficient to constrict the excited capillaries so as to produce internal

congestion, but its long continuance disorders the distribution and the properties of the blood, to a greater degree, than if these vessels had been less excited. The heart, by the frequency of its contractions, forcibly propels the vital fluid to the extremities and surface of the body, as long as the circulation is vigorously maintained in those parts, but its energy gradually subsides, as the superficial capillaries are depressed and the blood receives an inward determination. When the contractions of the heart become weaker, there remains, however, for a time, a *lingering* vascularity on the surface of the body, which presents to the influence of cold a considerable quantity of blood, the circulation of which is soon diminished, *being unsupported by the strong action of the heart*. The hardy Russian frequently rolls himself in snow, on quitting the warm bath, without suffering any inconvenience; the heated water in this instance, stimulating the heart to inordinate action, by exciting the superficial capillaries, the improved qualities of the blood and its more vigorous circulation thus produced, fortify the system, for a time, against the disagreeable effects of cold.

Dr. CURRIE, in his valuable work on cold

affusion, lays down certain rules which ought to regulate the employment of it in cases of fever, and which may be reduced to the two following :—*whenever animal heat is great, from increased production, cold affusion is beneficial or may be used with perfect safety; but, when it is only moderate, and unaccompanied by those symptoms which unequivocally indicate the more complete arterialization of the blood, its application is dangerous, or its utility doubtful.* This distinguished physician does not seem to have been fully aware, that it was the quality of the sanguineous fluid and the character of its circulation which authorised the employment, and explained the beneficial or injurious influence, of cold affusion; but, though his knowledge of this important fact was imperfect, the world is greatly indebted to him for his accurate and extensive observations on this subject.

CHAP. XIII.

The Influence of the Mind on the Distribution and Qualities of the Blood.

AN inquiry into those causes, which, either directly or indirectly, influence the production and propagation of cholera, would be incomplete, unless the agency of the mind were duly considered and determined. The power which it exercises over the animal system on many occasions, is evident to the most superficial observer. How often are the vital powers deranged by disagreeable news, and the foundation of numerous diseases thus laid in the system ; and how often, again, are diseases removed or alleviated by pleasurable emotions ! Although mankind, from the most remote period, have been sensible of these effects of mental emotions, they were entirely unacquainted with the mode in which the mind produces them. It was generally supposed, that they were referable to the transmission of a nameless and mysterious *something* through the ner-

vous system in direct connexion with the sensorium, but how it gave rise to acute and chronic diseases, was left altogether unexplained.

In the "Experimental Inquiry," it has been shewn, that all violent passions act on the system wholly through the respiratory function, and, from the changes which they effect in it, occasion important modifications in the distribution and qualities of the blood. When the mind is suddenly surprised by any unpleasant occurrence, a deep sigh is immediately drawn, and when its attention is absorbed by the recital of an affecting story exciting an intense interest, the same effect is frequently produced, either at short intervals during the recital, or at the conclusion of it; if lively feelings, on the contrary, are excited in the mind, they are expressed in the loud and frequent laugh or in a continued flow of animated conversation. Mental emotions operate in two ways on the properties of the sanguineous fluid:—1st, *they excite or depress the respiratory function*; and, 2ndly, *they augment or diminish muscular exertion*.

Having proved, in the preceding pages,

that the oxygenation of the blood is regulated by the quantity existing at any one moment in the lungs and the frequency of its circulation through them, it is not difficult to comprehend in what way the different passions, by disordering the functions of these organs, give rise to corresponding modifications in the properties of the circulating fluid.

Laughter and sprightly conversation are expiratory acts, and, as they are quickly repeated, when the mind is exhilarated, they invariably promote the general diffusion of the blood and consequently diminish the quantity circulating at any one moment in the lungs, thus necessarily conducing to its more extensive chemical changes. Were it, however, impossible to explain, exactly, how expirations influence the qualities and distribution of the blood, the practical nature of the views here proposed would remain unaffected, because it is indisputable, that certain evident conditions of the sanguiferous system always co-exist during the prevalence of such actions, which conditions are never observed when the mind is unexcited or depressed. The pulse is frequent and strong, the countenance glowing, and sometimes suffused with moisture, and

there is, likewise a manifest increase in the production of animal heat, as shown by the less susceptibility of the body to cold and other indications not necessary to be enumerated. As these effects cannot arise from any other circumstance than a decided improvement in the properties of the blood, we are entitled to conclude, that lively emotions are the cause of such important modifications, principally on account of the power which they exercise over the respiratory function, though all the phenomena are not to be ascribed to this cause alone. Exhilarating feelings never fail to excite various kinds of muscular contractions besides those belonging to the respiratory apparatus, which also accelerate the circulation, and improve the chemical changes of the blood.

Were the system excited for a short time by exercise, without the respiration being directly quickened, the state of the pulse, and the appearance and temperature of the body would clearly show, that the vital fluid had consequently undergone additional modifications. It appears, then, reasonable to refer the grateful influence of cheerful emotions to two causes; an increased action in the respiratory function,

and an accelerated motion of the blood produced by different kinds of muscular exercise. It is not at all improbable, that the great improvement which sometimes takes place in the health of patients, in a low and desponding state, when they go from home or mix more with general society, is almost wholly attributable to the lively feelings excited by cheerful intercourse with such society and increased bodily exercise ; the combined operation of which confers on the blood more vital properties, which gradually remove or alleviate internal congestions, give greater tone and energy to those organs whose office it is to digest and assimilate food, oxygenate the blood, and regulate its circulation. Persons who have naturally a great flow of spirits, rarely complain of dyspepsia, or much less frequently than those of an opposite disposition. The strong pulse and florid complexion of persons of lively temperament, and the comparative ease with which they bear cold, clearly indicate more stimulating qualities and a more equable distribution of blood. Although it is impossible to ascertain the exact degree of benefit which exhilarating feelings confer, knowing that it is great, the best means of exciting them ought to be em-

ployed when we are endeavouring to correct the deranged conditions of the sanguiferous system.

Depressing emotions may be divided into two classes : those which are strong, but transient, such as are experienced in cases of fright or sudden surprise ; and those which, though gentle, are permanent, such as are felt in the ordinary cases of mental despondency. They both produce the same general effect—a derangement in the properties and circulation of the blood : the one, determining a considerable portion of it to the internal organs, either completely arrests the action of the heart, or renders it irregular and feeble ; the other, necessarily lessening the frequency of all expiratory acts and withdrawing the individual from cheerful society, lively amusements, and whatever is capable of freely exercising and invigorating the body, greatly disturbs the functions of the sanguiferous system. That blood, under these circumstances, is disordered both in its qualities and distribution, is proved by the usual symptoms attending depressing emotions, when they have continued for a considerable time, such as palpitation of the heart, cough or difficulty of breathing, a small and

frequent pulse, pain in the head, diminution in the production of animal heat, and an evident derangement of the chylopoietic viscera. It is, then, sufficiently evident, that the influence which the mind is capable of exercising over the animal and organic functions is considerable, and it ought not, therefore, to be overlooked in the investigation of the causes which produce disease.

CHAP. XIV.

The Influence of Impure Air on the Distribution and Qualities of the Blood.

It is a matter of the utmost importance to ascertain the mode in which the animal economy is influenced by impure air, however generated; but the investigation of this intricate subject is attended with difficulties of no ordinary kind. It has been imagined by some, that the stomach is chiefly affected on the inhalation of deteriorated air, because its functions are observed to be very much disordered by it, and its structure found considerably diseased after death:* whilst others have supposed

* Les miasmes délétères agissent avec une activité et une intensité différentes, suivant plusieurs circonstances: quelquefois leur action s'exerce avec une rapidité étonnante; le système nerveux est pour ainsi dire paralysé; le principe de la vie paraît étouffé; et l'on voit des individus périr quelques instants après avoir pénétré dans un foyer d'infection. Le plus souvent l'action des miasmes est moins active: quelque temps après l'infection il se développe une réaction inflammatoire, qui a ordinairement son siège dans les voies digestives, le cerveau, et quelquefois les poumons.

that the lungs, or the brain, are first injured by it. Thus, widely differing in opinion on this highly important subject, it does not, however, appear that any one of the most dis-

Ces principes pénètrent dans l'économie par trois voies différentes : par la peau, les poumons et l'estomac. L'absorption des miasmes par la peau est suffisamment démontrée par l'expérience que Bichat fit sur lui-même, et qu'il a consignée dans l'*Anatomie Générale*. Il est certain qu'ils sont aussi absorbés dans les voies aériennes, où ils pénètrent avec l'air atmosphérique. Enfin, mêlés avec les aliments et la salive, ils sont introduits dans l'estomac, sur lequel ils agissent alors directement. Quelle que soit la voie par laquelle les miasmes pénètrent dans l'estomac, il est incontestable qu'ils portent principalement leur fatale influence sur ce viscère. On ne peut pas en douter quand on voit les individus qui séjournent dans les foyers d'infection être affectés d'anorexie, de vomissement, de coliques et de diarrhée ; on peut encore moins le révoquer en doute, quand on observe que les principaux symptômes du typhus, de la fièvre jaune et de la peste du Levant, et les altérations que ces maladies laissent sur les cadavres, appartiennent à la gastro-entérite. Comment expliquer que les miasmes introduits par l'absorption cutanée et pulmonaire irritent spécialement la membrane muqueuse digestive ? Il est impossible sans doute de le faire ; mais le fait n'est pas moins avéré. Sait-on davantage comment le virus de la variole exerce sa première influence sur cet organe ? comment l'arsenic déposé dans le tissu cellulaire ou dans le vagin ulcère le canal intestinal, et laisse les autres organes intacts ? Les miasmes délétères, quand on compare leur action à celle de ces deux derniers agents, ne prouvent donc rien en faveur de l'opinion de ceux qui soutiennent l'existence de causes morbides générales.—*Exposition des Principes De la Nouvelle Doctrine Médicale.* p. 338—9.

Je crois bien que la simple action d'une substance délétère sur les nerfs du poumon, peut avoir un effet très-marqué dans l'économie, qu'elle est même capable d'en troubler les fonctions d'une manière

tinguished physiologists has explained, in a satisfactory manner, the modifications in the qualities and distribution of the blood consequent on the breathing of deleterious air, by which term is meant the unhealthy condition of that which is breathed, whether occasioned by animal bodies in a confined or ill-ventilated situation, or the decomposition of animal or

très-sensible ; à peu près comme une odeur, en frappant simplement la pituitaire, agit sympathiquement sur le cœur, et détermine la syncope, comme la vue d'un objet hideux produit le même effet, comme un lavement irritant réveille presque tout à coup et momentanément les forces de la vie, comme la vapeur du vinaigre, le jus d'oignon, portés sur la conjonctive pendant la syncope, suffisent quelquefois pour réveiller tous les organes, comme l'introduction de certaines substances dans l'estomac se fait subitement ressentir dans toute l'économie, avant que ces substances aient eu le temps de passer dans le torrent circulatoire, etc.

Je me borne donc à examiner sur quel système se porte principalement l'influence des substances délétères mêlées avec le sang dans diverses espèces d'asphyxies. Or, tout nous annonce, 1°. que c'est en général sur le système nerveux, sur celui surtout qui préside aux parties de la vie animale ; car les fonctions organiques ne sont troublées que consécutivement ; 2°. que dans le système nerveux animal, c'est le cerveau qui se trouve spécialement affecté ; 3°. que, sous ce rapport, M. Pinel a eu raison de classer parmi les névroses différentes asphyxies, celles surtout dans lesquelles il y a, outre le contact du sang noir, la présence d'un délétère. Voici différentes considérations que me paraissent laisser peu de doutes sur cet objet.—*Anatomie Générale, Vol. 1, p. 209 et 216.*

It is evident from the first extract, that the stomach is regarded by BROUSSAIS, as principally diseased on the inhalation of impure air ; but the explanation it contains does not satisfactorily ac-

vegetable substances impregnating the atmosphere. It is not unusual for persons, on opening a grave or common sewer, to be so powerfully affected by the escape of gas, as immediately to be rendered insensible, and subsequently to exhibit all the well marked symptoms of cholera, showing that the blood has been determined to the internal organs in un-

count for the mucous membrane of the digestive organs becoming particularly affected in such cases. The disordered conditions of these organs, are justly attributable to a previous derangement of the circulatory system, arising from the enfeebled action of the heart or the diminished susceptibility of the brain, or, most probably, from the co-operation of both causes. Internal congestion exists in a greater or less degree throughout the system, and it therefore follows as a necessary consequence, that the digestive apparatus will participate in it, so as to cause, during life, particular symptoms, and after death numerous traces of disease.

The passage quoted from BICHAT shows the importance which he attached to the affection of the nervous system, and to a certain extent his ideas are just ; but to the best of my knowledge, he does not explain how the modifications in the qualities and distribution of the blood are occasioned by the miasmatic matter acting on the nerves of the lungs, or on the brain itself, and he has certainly formed incorrect notions of the manner in which syncope (adduced in support of his views) is generally produced ; since it is not occasioned, as he erroneously supposes, by the heart sympathizing with the affection of the pituitary membrane. The sensorium is, in the first place, influenced, and the changes effected by it in the respiratory function are the real cause of the enfeebled or suspended action of the heart. Disagreeable objects and unexpected occurrences operate precisely in the same way on the respiratory organs.

due proportion. Such facts clearly prove that something is conveyed into the system, but can the influence which it so evidently exerts, be explained on the supposition that the stomach or the brain is primarily and exclusively attacked, or that having been received by the lungs, it is thence communicated by the blood to every part of the body ?

The qualities and distribution of this fluid are easily disordered by whatever diminishes the sensibility of the sensorium, or the action of the heart. It has been shown, in the foregoing pages, that the chemical changes in the lungs are interrupted when the functions of these organs are, in any degree, deranged ; hence it cannot, for a moment, be doubted, that this effect will be produced when the brain has lost its ordinary sensibility. The impure air which is inhaled is a direct sedative, and its influence is exerted on the animal system, principally in two ways. 1st—*by enfeebling the action of the heart ; and, 2dly—by lessening the sensibility of the brain.* I have been convinced, by repeated experiments, that the contractility of the heart is easily destroyed on the direct application of a sedative, and it is, therefore, natural to suppose, that it

will be similarly affected by the deleterious properties of miasmatic matter conveyed to it by the circulating fluid : especially since it is well known that its action, under the influence of such matter, is feeble or irregular. Physiologists may, however, differ in their explanation of this phenomenon. If the contractions of the heart are less energetic than usual, the lungs will necessarily, in a short time, become congested, because the blood, not passing in a given period so frequently through them, fails to undergo its ordinary chemical modifications, and the deterioration of its properties occasioned by this circumstance will, of course, gradually increase its sedative effects, and render its circulation internal. As the distribution of the blood is regulated by the degree of its oxygenation, a diminution in this process will necessarily produce the effect just described throughout the whole of the internal organs. In proof of the accuracy of this opinion, that when the chemical changes in the blood are impeded, the extremities and surface of the body are cold, the liver is engorged, and pain is felt on pressing any part of the abdomen, a sense of sinking or oppression is felt about the præcordia, the respiration is quick and difficult, and the pulse small, as

well as generally frequent. These symptoms vary according to the susceptibility of the constitution, and the severity of the cause. On the inhalation of impure air, instead of a continued diminution of the powers of life, a kind of reaction sometimes takes place in the system. Even in this case, however, it is very evident, that the blood is rather *internal* than *external* in its circulation. The appearance of it when drawn from a vein, the state of the pulse, the temperature and general aspect of the body, with other unequivocal signs, clearly shew, that the action which is excited is not purely inflammatory ; if it were, the distribution of the blood would be external, to a much greater extent than it is. On the dissection of those who die from breathing deleterious air, the whole of the abdominal and thoracic organs are found engorged, or exhibit traces of inflammation : the liver and the spleen are sometimes immensely large, or the lungs no longer crepitate, but are, on the contrary, occasionally as firm in texture as the liver itself ; and the blood, throughout the system, is of a dark venous colour. If the brain is supposed to be primarily and chiefly affected, it is still necessary to explain in what way such extensive changes as these are induced. The

sensorium has not the power of modifying directly the qualities and distribution of the blood. Its sensibility is essential to the correct performance of the two acts of respiration, and whenever, therefore, it is diminished, the function of the lungs will be disordered to a corresponding degree, which will, of course, disturb those conditions of the circulatory system essential to the proper chemical changes of the vital fluid. Hence, it is obvious, that the same effects are produced, whether we suppose the heart, or the brain, to be primarily influenced. But why should it be supposed that one, or both of these alone are affected, when the noxious matter which disorders either of them will affect every other organ of the body, being necessarily conveyed to all in the course of the circulation ?

Whether impure air is absorbed by the lungs, the skin, or the mucous surface, the blood receives it and transmits it to every part of the animal system. Its morbid agency will, however, be chiefly exerted on the heart and the brain, which will be simultaneously, but, perhaps, unequally affected by it. It is allowed by most physiologists, that the capillaries exercise considerable power in the circulation of

the blood : the functions of these vessels will therefore be deranged, as a necessary effect not only of the disordered action of the heart itself, but also of the *diseased condition of the blood*, which influences the contractions of this organ. The liver, the spleen, the kidneys and the mucous membrane of the gastro-pulmonary and genito-urinary organs may be incapacitated from performing with ordinary energy their several operations, as a necessary consequence of the weak and disordered state of those organs, without the blood and its distribution being immediately and extensively injured. The respiratory organs are simply for the purpose of exposing the blood to the action of the inspired air, and as long as the quantity exposed is not greater than natural, the ordinary chemical changes are effected, providing the air possesses its proper qualities ; if not, as before remarked, it will enfeeble the action of the heart, and lessen the sensibility of the sensorium.

The animal system may be so gradually and slowly injured by the habitual breathing of impure air, that this may not appear the cause of the functional and organic derangement which ultimately occurs. The

imperceptible manner of its operation, is peculiar to situations, which may not be sufficiently unhealthy to give rise to any epidemical disease, but only to general disorder of the vital powers, to which no term can be applied exactly descriptive of its nature. Whether these be gradually or suddenly disturbed by impure air, there is no difference in its mode of action, except what arises from a difference in the degree of its deterioration. When its influence is exerted gradually and slowly, every part of the human frame becomes deeply involved in the derangement induced, and though the stomach, the liver, or the lungs only, may seem affected, it is, however, just to regard the body generally as diseased, its several organs being disordered in different degrees from their greater or less susceptibility, or the importance of the functions performed by them.

When its operation is sudden and violent, death or some severely morbid effect is immediately produced. In this case, the moving powers of the blood are arrested, or exceedingly depressed, before the rest of the system has had time to be equally implicated in the mischief, though, even under these circumstances, the

whole of the animal economy will necessarily be deranged.

It has frequently been urged as an objection to the existence of impurities in the atmosphere, that they have never been discovered by the investigations of the chemist. A given quantity of air being examined, whether taken from high or low situations, or such as are reputed healthy or otherwise, always affords, on analysis, the same proportions of the gases of which the atmosphere is composed ; and hence it has been said, there is no proof that the air is deteriorated in its properties. It requires little ingenuity to expose the fallacy of this reasoning, which seems to imply, *that the air can only be deteriorated by a diminution of its proper elements, and not by any addition to it, though this may be highly detrimental to life.* Chemists may readily determine whether the gases exist in their natural proportions, but it is not in their power to discover the various animal and vegetable matters, occasionally abounding in the air, which may exert a powerfully depressing influence on the powers of life. The numerous effluvia offensive to the organ of smell, may be entirely lost in the process instituted to ascertain the

composition of the atmosphere, their nature and affinities being entirely unknown. Some persons are particularly susceptible of the odour of certain flowers, so much so indeed, as to faint, if they breathe only for a short time the air impregnated with the fragrant particles. Could the chemist, in his analysis of any portion of this air, detect these particles, and say what other matters co-existed with them ?

CHAP. XV.

Sympathy between the Skin and the Liver illustrated by the Influence of Heat and Cold on the Secretion of Bile.

THE subject I propose to investigate in this Chapter, is highly interesting and important. Its elucidation is intimately connected with the various principles developed in the present physiological inquiry ; the extent of which principles will be better appreciated and understood by every new application of them. The sympathy between the skin, the liver and the abdominal organs generally, has been often observed, but never satisfactorily explained. "There exists," says Dr. JOHNSON, "between different and often distant parts of the body, a certain connexion or relation, which, in medical language, is called 'consent of parts'—that is, where *one* is affected by particular impressions, the other sympathises, at is were, and takes on a kind of analogous action. This sympathy or con-

sent of parts, has never been *satisfactorily* accounted for, by the ablest of our physiologists, nor—*mirabile dictu*!—by the most ingenious of our theorists. Of these sympathies none are more universally remarked, or familiarly known, than that which subsists between the *external* surface of the body and the *internal* surface of the alimentary canal. This, indeed, seems less incomprehensible than many others, since the *latter* appears to be a continuation of the *former* with the exception of the cuticle.” “There is no other mode of accounting,” the same author remarks, “for the phenomenon, than through the medium of the brain, the *sensorium commune*, to which all impressions are transmitted, and whence all nervous influence proceeds.”* If the sympathy existing between the surface of the body and the internal organs were of a nervous kind, the preceding explanation might be considered sufficiently satisfactory, but, as it is not of such a kind, we must endeavour to discover some other and more probable cause of the phenomena in question. When the body perspires freely from exercise, or excessive heat, the billiary secretion is increased, a fact which is

* The Influence of Tropical Climates, page 8. Edit. 4th.

generally adduced to prove a sympathetic connexion between the liver and the skin, *the excited action of the latter being accompanied by a similar excitation in the former*. The co-existence of these two circumstances, has led physiologists to regard one as a cause, and the other as an effect. In support of this hypothesis, it is further stated, that when the surface of the body is constricted by cold, the secretion of bile is diminished.* It would be as extraordinary as it is improbable, that external impressions communicated to the *sensorium commune*, or sympathies otherwise excited in it, should be transmitted to the liver, and derange its functions.

The secretion of bile, as well as all other secretions, is derived exclusively from the blood, and it will, consequently, be liable to be affected by all modifications in the properties and distribution of this fluid. Many other phenomena co-exist with, or immediately succeed the impressions of heat and cold, which are no less difficult of explanation on the supposed action of nervous influence than the secretion of bile. When the system is stimu-

* Influence of Tropical Climates. p. 182.

lated by heat, the perspiration is proportionately increased; *the pulse is strong and frequent, the temperature of the body higher than natural, and the capillaries vigorously excited*: but when it is depressed by cold, the surface and extremities are chilly, the pulse small, rather frequent, and occasionally somewhat full; never, however, characterised by great strength, whilst the blood is particularly *internal* in its circulation. Were it even allowed, that these two agents communicate to the sensorium corresponding impressions, it could not be proved by the supporters of the doctrine, that they produce the various excited or depressed conditions co-existing with them, since they cannot directly modify the properties and distribution of the blood. It is, therefore, clear that this doctrine is inadequate to account for the different phenomena consequent on the application of heat and cold: but the *sanguineous* relations existing between the surface of the body and the internal organs, will be found, without any undue assumptions, amply sufficient to elucidate the subject. The circulatory system may be considered as uniting, in one common bond, the animal economy, so as to render it impossible that any one part of it should be influenced to a considerable

extent, without immediately deranging the laws which regulate the whole. Artificial heat, or the genial warmth of summer, occasions alterations in the diffusion of the blood, calculated to facilitate its chemical changes in the lungs. Perspiration is simply the effect of the increased production of heat. The more general distribution of the vital fluid, and the strong and accelerated pulse, are attributable to the improved qualities of the blood; *and to this cause we must, also, refer the augmented secretion of bile.* The liver participating in the general conditions of the sanguiferous system, is necessarily stimulated, and the various modifications occurring in its functions are, consequently, in harmony with the evident causes in operation. That the increased secretion of bile does not arise from a mysterious sympathy existing between the skin and the liver, appears to be fully proved by the effects of exercise on the body: Dr. JOHNSON, himself, allowing that exercise promotes the flow of bile—a fact which cannot be explained by supposing, *that it calls into play sympathies similar to those imagined to be excited by the application of heat.* Exercise accelerates the circulation, and facilitates the natural changes of the blood, and hence we are entitled to expect

the same results from the influence of like causes in operation. When cold is applied to the surface of the body the capillaries are constricted, and the blood is determined to the internal organs, so that the ordinary chemical actions in the lungs are impeded, and the blood is less completely oxygenated, causing the secretory functions of the liver to be proportionately depressed or deranged. That the sympathy between the liver and the skin is of a *sanguineous* and not of a *nervous* character, appears still more obvious in investigating the striking relations between them in chlorosis, dyspepsia, and other diseases, and particularly in cases of mental emotion. In these different affections the blood is either more or less stimulating than usual, in proportion as it is external or internal in its circulation, and the functions of the liver and the skin correspond in activity with the various conditions of the sanguiferous system.

CHAP. XV.

Functional and Organic Disease.

THERE are few terms more frequently employed in medicine than *functional* and *organic*, as descriptive of different kinds or degrees of disease ; but it may be inferred from the indefinite and various notions attributed to them, that the conditions of the system, which they are supposed to indicate, are very imperfectly understood. The general observations made on this subject, as well as the opinions contained in the best Medical Treatises of the present day, seem to convey an idea, that the function of an organ is somewhat independent of its structure or physical conditions, for it is commonly said, in speaking of many diseases, that they are *only* functional. Now, it is impossible for functional disorders of any kind to occur without being the consequence of organic changes. The term organic, in contradistinction to functional, is conceived to imply a *manifest* alteration in the structure of an organ—such as a diminution or enlarge-

ment of its substance, or some evident change in its appearance. It cannot, however, be doubted, that unequivocal modifications may take place in the numerous capillaries of an organ, such as a total or partial obliteration of many of them, and yet, on an ordinary examination, no traces of such modifications may be clearly perceived. The structural difference between the lungs in youth and in old age, is shown, by microscopical investigations, to be very great; and yet, these organs, at an advanced period of life, appear generally healthy, particularly if they have not previously been affected by diseases which have occasioned evident disorganization in them. I have endeavoured to show in a preceding Chapter, that the structural changes of the capillaries in old age, are attributable to various causes, to the operation of which the human frame is necessarily subject during the chequered course of its protracted existence, such as different diseases—or even disorders of the most apparently trifling nature—the vicissitudes of the seasons, mental emotions, and various other causes, which have a tendency to induce such structural changes throughout the system, by modifying the healthy properties and distribution of the circulating fluid.

Functional disorder is, in most cases, a diseased action of the capillaries, the structure of which is almost sure to be more or less affected at the time, although it is not in our power to demonstrate the fact. Nature, as already observed, has not been so parsimonious in her gifts, that even a permanent diminution of them in the animal economy necessarily becomes immediately manifest in the less perfect operation of the vital powers, and, therefore, the absence of direct evidence cannot be considered as proving that organic changes do not succeed every striking functional derangement. According to this view, it is clear, that diseases, generally considered functional, are unquestionably organic.

To illustrate this opinion, let us suppose the case of a person who, after having partaken heartily of an excellent dinner, receives unwelcome news, which depresses his spirits, and in a short time produces great oppression about the region of the heart, fulness of the stomach, accompanied by frequent eructations, pain in the head, nausea, vomiting, and perhaps diarrhœa. This morbid state of the system would not be regarded by the practitioner as organic disease, because, in a few days, the

various symptoms disappear, and the individual regains his usual health, which is indeed the only argument that can possibly be adduced in proof of the functional nature of the disorder. During the continuance of these symptoms, the properties and distribution of the blood are very much disordered, as shown by the striking changes in the circulatory system—changes by which the whole of the capillaries are powerfully affected, but some, in certain situations, more strongly than the rest. A succession of similar derangements, generally occasions manifest organic alterations, a fact strongly corroborative of the reasoning I have previously employed, as it seems to show, *that a certain degree of disorganization is the effect of every attack, or why should a repetition of it almost invariably produce such disorganization?* We cannot, for practical purposes, direct the attention too closely to the condition of the capillary system, when the properties and distribution of the blood are disordered, however unimportant the causes of its derangement may at the time appear, *for as all the vital actions are performed by this system every slight disturbance of its functions is gradually and permanently diminishing the energies of life.* The terms functional and organic may, indeed, be employed to describe

different degrees of disease, but not, as they have hitherto been, applied, to express actual differences in the nature of the diseases themselves, which cannot be clearly ascertained to exist. The former may be justly considered as implying a disordered state of the blood, or some inequality in its distribution, in consequence of which, the capillaries are either generally or partially affected, according to the nature of the disturbing agents. The latter, on the contrary, may be conveniently used to define certain obvious modifications of structure.

The morbid condition of the capillaries, constituting functional disease, according to this definition of it, is often never wholly removed by nature, or the remedies prescribed; and though it may not, at an early period of life, be detected on dissection, or in the less regular and efficient action of the vital powers, it may be rendered strikingly manifest in old age, from the conjoint operation of many injurious circumstances occurring during an extended course of existence. The principles here laid down, will enable us to explain, in what way functional is more liable to give rise to organic disease in one situation

than in another, as well as the cause of certain organs being acutely susceptible of disorder. The lungs and the liver, more frequently than other parts of the system, are found, after death, in a diseased condition. The former will necessarily be chiefly composed of capillary vessels, in order to expose the sanguineous fluid to the action of the inspired air, and the latter will, also, necessarily be organized in a similar manner, in order to carry on the process of secretion, and perform the office of a *diverticulum*, and it cannot, therefore, be considered extraordinary, if we keep in view these circumstances, that the lungs and the liver very frequently exhibit similar structural modifications. How numerous are the causes capable of disordering the functions of the capillaries? This important system of vessels is continually liable to be influenced by the vicissitudes of the seasons—the alternations of temperature—mental emotions—local and general diseases, and other circumstances, which it is unnecessary to enumerate.

It is probable that some organs much sooner recover their usual vital energies, after what may be called functional disturbance, than others, in consequence of structural

and functional differences, which it may not be uninteresting briefly to examine. *Organs, whose office it is to secrete, and whose secretions remain in contact with the membrane from which they are derived, are perhaps more liable to suffer severely from every functional attack than others which do not secrete a nutritious fluid, or one which remains in contact with the secretory vessels.* In the case in which the fluid continues in contact with the membranous surface that produces it, whenever it is poured out, either morbid in quality, or too profuse in quantity, it is calculated to aggravate the disease of the capillaries, and to prolong its duration much beyond the operation of the primary derangement. But in those instances, on the contrary, in which the fluid is removed from the vessels that secrete it, they are not particularly liable to have their existing disease increased in severity, by the injurious influence of such fluid, and, hence, vessels, so circumstanced, will more easily recover their natural action, than those which are continually irritated by the contact of the morbid matter secreted by them. Organic diseases may arise from two very opposite causes, *a deterioration of the vital fluid and its consequent internal distribution ; or a too excited*

state of it, arising from its highly nutritious and stimulating qualities, and its consequent accelerated circulation. The former condition of the sanguiferous system produces disorganization, by giving to the capillaries an undue proportion of imperfectly oxygenated blood; the latter occasions permanent structural changes in the heart and arterial system, such as an enlargement of substance or ossific depositions, from too much nourishment being furnished to them. In these observations on functional disease, I have had in view cases of recent occurrence, and of decided character only, having, indeed, intentionally left out of consideration the slighter degrees of derangement which might, perhaps, be looked upon as purely sympathetic; which, according to the vague notions entertained on this subject would, therefore, be regarded as affording no striking illustration of the correctness of my opinions. They will, however, if carefully and minutely studied, be found to corroborate the principles I have advocated. It may, perhaps, appear to some an undue extension of these principles to state, that the frequent attack of headaches can, in most instances, be shown to arise from a disordered action of the capillaries of the brain, and not from any mysterious nervous con-

nexion existing between this organ and any other, which may at the time be in a morbid condition, transmitting, as is supposed, its prejudicial influence directly to the brain. Headaches are frequent and sometimes exceedingly acute, just before the uterus exercises, for the first time, its secretory function, generally occurring immediately before and after every succeeding periodical change, whenever the action of this important function is so far deranged as to be either wholly or partially obstructed. In all such instances I am persuaded that the cause of the cerebral affection, whether of a trifling or serious kind, is to be traced to a diseased condition of the capillaries of the brain, co-existing with a similar disorder in this system of vessels, extending throughout the whole body, and arising most probably, from irregularities in the distribution and properties of the blood.

In confirmation of this opinion it may be stated, that the disorder declines as the circulatory system recovers its natural energies. A line of practice very different from that commonly used in the treatment of those conditions of the system on which headaches, indigestion and many other diseases depend, was

suggested to me by the preceding view, in following which, a determined course of active measures was adopted, which would otherwise have appeared too bold and empirical to warrant a continued or repeated employment of them, though they might occasionally have been attended with the happiest results. Many extremely distressing cases, of several years standing, have been entirely cured by these active measures, after all the ordinary remedies had been tried in vain. Indistinct, weak, or impaired vision has so frequently co-existed with derangement of the stomach, that it has, in numberless instances been considered to arise from the morbid action of this organ, (a sympathetic connexion being supposed to be maintained, by certain nerves, between the stomach and the brain,) and has been treated as if such were its origin: and the success attending the practice suggested by this view of the subject, has been generally regarded as a proof of its correctness. That such a connexion exists, and that it may sometimes produce effects which cannot apparently be justly referred to any other cause, will not be denied; decisive evidence can, however, be adduced to prove, that in the most remarkable cases of functional disease, the particular morbid effects

cannot be traced to any extraordinary influence transmitted along the course of the nerves from the stomach to the brain, but, on the contrary, *to a morbid state of the capillaries of this organ originating in the disordered condition of the sanguiferous system, which arises from indigestion and its attendant train of diseased actions.* Instead, therefore, of regarding the stomach as the cause of numerous inexplicable sympathies, transmitted through the nerves to the brain, it is more correct to consider both organs in many instances, as similarly circumstanced with respect to the condition of the capillaries, from being equally affected by the derangement of the circulatory system; and on those occasions in which the stomach is evidently the cause of various disorders, its injurious influence is chiefly referable to the modifications produced by it in the properties and distribution of the blood. My attention was a few weeks ago particularly directed to the consideration of the causes of imperfect vision, in consequence of my own eyes having become exceedingly painful and weak, though they retained their natural appearance, and these effects could not be attributed to any undue employment of them. The weakness and pain gradually increased,

until they could scarcely bear the light of day. During the whole of this time the appetite was good. About the third week of the disease the body became slightly jaundiced, accompanied by great depression of spirits. Many remedies were applied to the eyes, but without the least benefit. It was at last very evident that this painful affection of the sight, as well as the general derangement of the system, was wholly referable to a change in the mode of living. I had long been in the habit of taking tea to breakfast, but had for several weeks preceding the symptoms described, taken coffee in place of it, made unusually strong and particularly rich by the addition of an abundance of cream. This important change had gradually disordered the vital powers, and led to modifications of the sanguiferous system—modifications to which the weak and painful sight was attributable, as the capillaries of the brain are liable to participate in the deranged condition of the whole body. On a return to my usual mode of living, the disorder in the eyes gradually became less violent, until it was at last entirely removed. This case illustrates the truth of an opinion previously stated respecting the dependence of various co-existing diseases on

the same morbid state of the sanguiferous system—a view which not only explains the origin and nature of many of them, much more rationally than the principles of sympathy, but, also, suggests practical improvements which clearly demonstrate its value. Many of the subjects, to which, in this chapter, I have only briefly alluded, will be considered more in detail in subsequent productions, in which will be given much juster views of functional and organic disease, than are at present generally entertained.

In investigations into the nature, seat, and symptoms of fever, and of various affections which are regarded as leaving, on the re-establishment of health, no permanent structural changes in the system, it will be shewn how greatly the capillaries are disturbed, on these occasions, as well as endeavouring to prove, by evidence derived from dissections, and symptoms during life, that many of these vessels belonging to the more important organs frequently remain in a morbid condition, though the constitution apparently recovers its usual vital energies. Some of the affections alluded to are indigestion, chlorosis and amenorrhœa, the source of numerous disorders ;

most of which, however, may be treated successfully by the same bold and decisive measures—measures suggested by a knowledge of their origin and relation to the general derangement of the powers of life always co-existing with them, and not by the particular symptoms which give them a locality, or the terms by which they are designated.

CHAP. XVII.

DISORDER OF THE NERVOUS SYSTEM, AND ITS
CONNECTION WITH VARIOUS MORBID CON-
DITIONS OF THE BODY.

SECT. I.

*The Physiology of the Nervous System directly
concerned in the Functions of Organic Life.*

THE difficulties of the subject about to be discussed in this Chapter, are unquestionably great. Many of the questions proposed for examination do not admit of clear elucidation, either from their natural abstruseness, or the impossibility of experiments being applied to them. Some, however, which it is highly important the physician should understand, may perhaps be rendered much more definite and practical than they have hitherto been, by patient investigation alone, without instituting new experiments; all that is requisite

to illustrate them being to collect and combine different portions of information from various quarters, and to concentrate upon them its scattered rays. Parts of the present subject have been treated in the "Experimental Inquiry," and would not have been introduced here, had it not been for the purpose of developing them more fully, and pointing out their intimate connection with morbid conditions of the body, not at all discussed in that work. Of the various imperfect or erroneous views on the nervous system, the majority are to be traced to a tendency more or less manifested by all writers, to adapt every thing to some exclusive or favourite principle, by which many natural phenomena are overlooked, or useful suggestions lost, an attention to which might be very serviceable in practice. One deeply impressed with the extensive influence of the nervous system on the functions of life, is disposed, at every step of his enquiries, to explain all the vital phenomena by the action of this system; another, with the same degree of partiality, attributes them to the operation of chemical changes, or properties considered altogether independent of nervous agency. The investigations and arguments of both are, however, useful, as

their mutual errors are frequently exposed by them. The brain and the spinal cord are generally admitted by physiologists to exert no direct influence on the functions of organic life. Both organs have occasionally been found wanting in the foetus, which was yet well nourished, and, the functions of organic life are, moreover, performed in animals naturally destitute of them. Direct experiments have, also, shewn, that long after the destruction of these organs the contractions of the heart and the capillary circulation continue, if the lungs be artificially inflated. Cases of monstrosity, in which the brain and spinal cord are wanting, may be allowed to prove that the functions of the sanguiferous system may be carried on independently of any influence derived from these organs, but the same inference cannot be legitimately deduced in respect to the other functions of organic life. However widely these may differ in their nature, their actions tend either directly or indirectly to the production of blood, and hence it may be asserted, that these actions cannot be effected without the constant co-operation of the brain and the spinal cord. The foetus being supplied with blood, by the maternal circulation, all that can be proved from the ab-

sence of these organs in it is, *that the functions of the sanguiferous system are independent of their direct agency.* Some writers maintain that the brain is essential to the action of the heart, an opinion, however, invalidated by acephalous foetuses, and the continuance of this action on the removal of the organ in numerous experiments which have been performed. BROUSSAIS, whose opinion is always entitled to respectful consideration, supports this doctrine, as is evident from the following passages in his *Treatise on Physiology applied to Pathology*:---“The involuntary influence of the brain upon the heart is then proved, in the circumstances of mental excitations, and extraordinary irritations of the encephalon. But does it exist without these conditions? Is it constant, and is it not merely exalted in the cases which we have just cited? I think we may reply affirmatively to this question.” “The main conclusion at which we ought to stop is, that the action of the heart is kept up by the influence of the brain; in other words that the cephalic nerves communicate to its fibres the stimulations which cause it to act.”* The fallacy,

* *Treatise on Physiology applied to Pathology*, Translated from the French, by JOHN BELL, M.D., and R. La Roche, M.D. Third American Edition.—page 266.

however, of the opinion which BROUSSAIS thus positively states has been proved by the experiments of WILSON PHILIP,* BRACHET,† FLOURENS,‡ and others.

Though the brain is generally acknowledged to exert no direct and permanent influence on the heart, these and other distinguished physiologists still contend, that such influence is exerted through the medium of the par-vagus on the lungs, stomach, and intestines. The cessation or disturbance of the powers of life succeeding the division of this nerve, has been referred to the interruption of cerebral agency. The severe derangement of the lungs is attributed by one to the paralysis of the muscular fibres of the bronchia and air cells, and to the disorder occasioned in the respiration, the par-vagus being supposed to regulate the performance of this function by the sensations which it transmits to the brain. The suspension of digestion is said by another

* An Experimental Inquiry into the Laws of the Vital Functions.—page 84—96.

† Recherches Expérimentales sur les Functions du Système Nerveux.—p. 78—80.

‡ Recherches Expérimentales sur les Propriétés et les Functions du Système Nerveux dans les Animaux Vertébrés.—p. 197—199.

to arise from paralysis of the muscular fibres of the stomach and small intestines; by a third, from cessation of secretion.—Absorption is, also, impaired or arrested by the same operation, and is said to be referrible to the withdrawal of nervous influence from the organs, the subject of experiment.

These different opinions shew that the par-vagus is, by some, regarded both as a nerve of motion and sensation. Experiments, indeed, unequivocally demonstrate, that it is endowed with the former property, but none have been adduced which so decisively prove that it is possessed of the latter. All the numerous branches of this nerve, distributed to the organs of voice and respiration, admitting of direct experiment, shew, that they are appropriated to the purposes of motion, and there are no just grounds for supposing that they are instrumental in the transmission of sensation, or, at least, this is by no means clearly established. The phenomena which have been adduced by writers as corroborative of this opinion may, perhaps, be shewn to arise from causes which have not been duly considered. BRACHET attempts to prove that the origin of the par-vagus satisfactorily accounts

for the properties of motion and sensation supposed to be manifested by it. He states that this nerve, like the spinal nerves, has a double origin, its filaments being traced to the sensitive and motory parts of the nervous system. This has not, however, been proved by others. They, on the contrary, have inferred the existence of these properties from effects produced on division of the nerve,—effects, which cannot, however, be admitted without additional evidence, as confirming such an inference. An examination of the different views and reasoning of physiologists on this subject, will, perhaps, determine the degree of truth of which it is susceptible in the existing state of our knowledge.

I. Direct experiments are adduced by BRACHET to prove, that the eighth pair of nerves are essential to the sensation of hunger and satiety. These nerves he divided in animals that had been kept many hours without food, introducing a tube into the trachea in order to maintain the respiratory functions, after which operation, the animals, he states, no longer manifested the feeling of hunger, which he considers as proved, not by their *refusing* to eat the food that was offered them, but *by their not seeking it*.

“ Ils mangeaient, parce que l’ aliment était devant eux, et que leur bouche en savourait encore le goût : car la faim n’en paraissait nullement la cause déterminante, *puisqu’ils n’avaient plus cherché à manger*, dès que la section des nerfs vagues a été pratiquée.” * It would appear from this mode of reasoning that the cutting of the windpipe, and the introduction of a tube into it, the division of the nerves and the large wound necessarily made in the neck are supposed to be attended with so little suffering, that it is truly extraordinary the animals do not exhibit after this painful operation their usual degree of liveliness. In my own experiments performed some years ago, for the purpose of ascertaining the influence of these nerves on the function of digestion, many of the animals in a short time after the operation, frequently ran about the room, as if in search of food, though in general they were little inclined to move ; but even admitting that they are dull and inactive, it does not by any means seem just to infer that they have lost the feeling of hunger *because they do not seek their food*. The lower animals always endeavour to gratify the prevailing sensations of the moment. If thirsty,

* Recherches Expérimentales sur les Fonctions du Système Nerveux Ganglionaire, p. 180.

they will drink, or if hungry, they will eat. Their actions are altogether the consequences of such sensations, and they are necessarily influenced by any causes, external or internal, which modify these sensations. A severe wound inflicted on any part of an animal renders digestion difficult ; and the same injury will, also, greatly lessen the sensation of hunger previously existing, *not because there is any direct change produced in the functions of the stomach and the eighth pair of nerves, but because other and far different feelings are excited in the mind—feelings which, in proportion to their energy, modify the sensations of hunger.* The animal, before the operation, urged by the strong and prevailing impulse of hunger, seeks its food with avidity, which it also continues to do for several hours after ; in eight or ten hours the avidity ceases, and not, however, in consequence of any disturbance of the nervous connexion between the brain and stomach, but of the acutely painful feelings occasioned by the wound. It cannot be doubted, that the operation produces considerable suffering which will necessarily disturb any previously existing sensation : hence it is quite clear, that the physiologist is not entitled to infer any thing positively from the experiment detailed above,

until he has determined the nature and extent of the influence which the suffering itself may exert. In those cases in which the nerves are divided, without any tube being applied to the trachea to support respiration, the animal is little disposed to eat. This disinclination for food cannot arise from the nervous relations between the stomach and the brain being more greatly deranged than in other cases in which respiration is preserved, for in both experiments the nerves are equally injured; and it must, therefore, be attributed to the greater suffering caused in the one case than the other, and the greater disorder occasioned in the functions of organic life, which may be shewn to be the real cause of the phenomenon in question, by diminishing the suffering of the animal, which is easily accomplished by the introduction of the tube. In order to form an accurate estimate of the influence of suffering alone on the appetite, the trachea was divided in several rabbits, and the tube introduced: it was found by this experiment that no part of the nervous system was injured by the operation, though the animal, in eight or ten hours after it, often became dull and inanimate, *in consequence of the pain which the slightest motion of the head occasioned.*

The animal is said to eat because the mouth retains a relish for the food placed before it. How is it proved that this relish is independent of the stomach ? or that it is not produced by the feeling of hunger which was so strongly manifested before the operation ? The keenness of the appetite would seem to indicate that it did not altogether depend on a lingering taste in the mouth. Placing food before the animal *is the means of restoring, or invigorating the sensation of hunger, which had been partly or wholly removed by other sensations, just as the introduction of the nipple within the lips of the infant awakens a desire for nourishment which was not previously felt, the mind, perhaps, being occupied with the transitory impressions of external objects.* This reasoning may be illustrated and confirmed by what is frequently observed to take place in a person with a keen appetite, who, when on the point of gratifying it, has his attention suddenly directed to something of importance ; his pre-existing sensation of hunger being thus entirely dissipated. Now, in this instance, can it be imagined, that the stomach has undergone any sudden and peculiar change ? The explanation of the phenomenon is doubtless to be found in the production of new sen-

sations. If this reasoning be admitted to be just, the division of the eighth pair of nerves cannot be considered as destroying the feeling of hunger, nor can these nerves be regarded as the cause of its existence in the natural operation of the system. BRACHET, however, not only contends that such is the case, but moreover endeavours to prove, that the association of these nerves with the brain is essential to the feeling of satiety. To determine how far his views were correct, the following experiments were performed :—

EXPERIMENT I.—In the first of these experiments the trachea and the par-vagus of the animal on which it was made, were cut on both sides: but its breathing was scarcely at all affected three quarters of an hour after the operation. When it was placed among the other rabbits, which were kept with it, it showed a strong desire to eat eagerly, seeking the food which was purposely thrown down at the farther end of the room. Four hours afterwards it manifested an equally strong desire, but did not, on either occasion, eat much, apparently in consequence of the pain caused by the effort to swallow. This rabbit was killed twelve hours after the operation. The esophagus was found, on dissection, much distended with green food.

EXP. II.—This experiment differed from the preceding, in one circumstance alone, that the nerve of the animal was cut only on one side. It manifested a strong desire to eat for the space of sixteen hours: and, for the first six hours, indeed, the keenness of its appetite was equal to that of the rest of the rabbits. It was killed twenty hours from the commencement of the experiment. The stomach was full, and a considerable quantity of food was also found

in the esophagus, but scarcely any at all within an inch from the cardiac orifice, nor was the stomach in this part distended, which seemed to prove that the partial lodgement of food in the esophagus did not arise from the stomach being incapable of receiving any more, as in that case the part of the esophagus nearest to the cardiac orifice, would have been full, which was contrary to fact.

EXP. III.—This experiment was highly satisfactory. The rabbit was about five months old, and extremely vigorous. The trachea was divided, and a tube as usual introduced into it, and the par-vagus was cut on both sides. The respiration was scarcely at all disturbed by the operation. Three quarters of an hour subsequent to its completion, the animal was restored to the place in which it was usually kept. On the door being opened shortly afterwards, it came rushing forward with the other rabbits for food, and no person could have discovered which of the animals had been subjected to the experiment, from any difference in the keenness of the appetite they displayed. When dandelion was thrown at the farther end of the room, the one in which the nerves were cut, ran in search of it with the same eagerness as the rest, even contending for it, and plucking it from the mouths of others. When this rabbit was killed both nerves were found, on dissection, divided. The stomach was about half full; the whole of the esophagus, however, was completely, distended, and seemed apparently to contain all the green food which the animal had taken after the operation, as by way of trial, it had been allowed to eat only a little.

EXP. IV. The rabbit on which this experiment was made was of the same age as the preceding, and even more vigorous; and the same operations, performed upon it, were followed by the same effects. The respiration was scarcely at all disturbed; and, on the door of the room (in which it was usually kept, and to which it had been restored half an hour after the operation) being opened, it came with the other rabbits, anxiously seeking food, for which, when it was thrown at the farther end of the room, it contended with the rest. Though the rabbits in these experiments, shewed the most unequivocal

cal disposition to eat, they did not take much food, in consequence, probably, of the pain and difficulty, as previously stated under Experiment I., of conveying it into the stomach. When they had chewed a small quantity, they always made great efforts to swallow, which evidently caused considerable suffering, occasionally producing partial vomiting and a copious flow of saliva, after which efforts the rabbit, as if exhausted, remained dull for some minutes, but would, in a short time, again eagerly seize food as in the first instance. On dissection, the nerves were found cut. The stomach was only about two-thirds full. The esophagus was distended its whole length, but less so about the cardiac orifice than in any other part.

EXP. V. The rabbit which was the subject of this experiment was of the same age as the two preceding, and the same operation was performed upon it. The respiration was scarcely at all disturbed. In twenty minutes after the operation the animal was placed in the room in which it was usually kept: on my holding oats, at least two feet from the ground, it eagerly followed me, and, when I had placed them on the floor, it contended for them as strongly as the rest. In five hours after the operation the keenness of the appetite was undiminished. Rabbits are partial to dry oats, and, in this experiment, nothing else was given, in order that it might be determined *whether any food at all passed into the stomach after the operation*. By confining the animals to green meat the day previous to the experiment, and to oats after the nerves were divided, it seemed easy to decide this question, in consequence of the striking difference between these two kinds of food even when masticated. On dissection, the stomach was found about two-thirds full, and the contents were composed entirely of green vegetables. The esophagus was rather more than two-thirds distended with masticated oats. Not a single particle had passed the cardiac orifice.

These experiments prove, beyond all doubt, that the division of the nerves does not destroy the desire for food, or even diminish it in any perceptible degree, during a few hours subsequent to the operation. When the wound becomes extremely painful, which it necessarily does, after a short time, the rabbit shews little disposition to

move, but the same thing often occurs, with very slight difference, when the trachea alone is divided.

These experiments, also, expose another fallacy in the conclusions of BRACHET. He states that when the eighth pair of nerves is cut the animal no longer feels satiety, and, therefore, continues to eat until it has completely filled both the stomach and the esophagus. I had not the least doubt of the accuracy of this opinion at the commencement of the experiments. In the second experiment, however, it appeared very questionable, the esophagus, containing a good deal of food, but scarcely any at all where it terminates in the stomach. It seems natural to suppose, if the animal ate, after the operation, until it had filled both the stomach and esophagus, that the inferior portion of the esophagus ought to be occupied first, and to be most full, which was not the case. To ascertain whether this supposition was well founded, the rabbits used in the subsequent experiments were allowed very little food for twenty-four hours previous to their performance. In these instances, as in the foregoing, the esophagus was distended, and yet the stomach was only about half full, clearly shewing *that this state of the former organ was not attributable to the want of capacity in the latter for receiving more*. From Experiment VI. it appears that no food passes into the stomach after the division of the eighth pair of nerves. It is clear, then, that the fact adduced by BRACHET in proof of the insensibility of the animal to the feeling of satiety, arises from a cause very different from the one assigned by him.

It is somewhat extraordinary that the division of the eighth pair of nerves does not affect all rabbits by any means in the same manner. In some the respiration appears very little affected in a quarter of an hour after the operation, in others it is laborious, though in all the tube has been equally introduced into the trachea. That the nerves in those whose respiration was little affected were divided, was always verified after death. The strong brown rabbit is far the best fitted for experiments, the delicate Spanish rabbit the least: the one is always bold, the other always timorous, the former will sometimes run about soon after the operation with almost its usual liveliness; the

latter remains squatted on the ground, as if fixed to the spot by sudden fright.

I have sometimes imagined that these various effects arose from the nerve not being divided at the same point in different rabbits: the true cause, however, will perhaps be found in the species and age of the rabbit on which the operation is performed. The full grown, or those approaching to the full size, are better subjects for experiments than the young. The following experiments were performed for the purpose of discovering the cause of the peculiar condition of the esophagus after the division of the eighth pair of nerves.

Experiments instituted for the purpose of ascertaining the cause of the esophagus being distended with masticated food after the division of the eighth pair of nerves.

EXP. VII.—The nerves and trachea of the animal, on which this experiment was made were divided, and a tube was fitted to the latter. The respiration was not at all disturbed by the operation. On the rabbit being restored to the room in which it was usually kept, it sought the oats thrown on the floor and ate them as eagerly as the rest; continuing to manifest the same appetite for food for the space of four hours subsequent to the operation, after which period, however, it shewed no inclination whatever to eat, though its breathing was perfectly natural. Even when not inclined to eat, it ran about, but was exceedingly timid, creeping into very unusual places on the approach of any one. This timidity was never displayed by any of the rabbits until it was evident, that great pain was experienced, or some peculiar sensation was excited, which appeared to arise from the food not passing the esophagus. When at rest, it appeared, as rabbits frequently do, affected by cold, the down standing somewhat erect, and the body collected into a small compass, so as to expose as little surface to the air as possible. On dissection the esophagus was found full of masticated oats, extending even to the pharynx; though none at all was observed in the stomach, it being rather more than two thirds full of partially digested vegetables, which had been taken several hours previous to the experiment.

EXP. VIII.—In this experiment the trachea of the animal was alone divided, after which it exhibited its usual keenness of appetite. It was killed ten hours from the commencement of the experiment. On dissection the esophagus was found perfectly empty. The stomach was a little more than two-thirds full.

EXP. IX .X. and XI.—In the first of these experiments the trachea only was divided ; in the second the trachea and the eighth pair of nerves on one side ; in the third the trachea and the nerves on both sides :—in half an hour after the operation the three rabbits shewed an equal anxiety for food, though the one in which the nerves had been divided on both sides was very soon observed to make great efforts in swallowing, after which it became dull, yet still continued, for several hours, to seek the oats as eagerly as the rest. They were killed in eight hours after the operation. In the one which had the trachea only divided, and in the other in which the nerve on one side only was cut, the esophagus was found empty, but in that in which both nerves were divided, it was quite distended with food ; the stomach was about one-third full, and none of the oats taken after the division of the nerves appeared to have reached it.

EXP. XII. and XIII.—In one of these experiments the trachea and the eighth pair of nerves on one side only were divided ; in the other the trachea and the nerve on both sides. In an hour after the operation, both rabbits shewed the same keenness for food, but the latter appeared, in a short time, to swallow with difficulty, and became dull. At the expiration of thirty hours from the commencement of the operation both rabbits were killed. The esophagus of the one in which the nerve was divided on both sides, was completely distended, that of the other in its natural state. The stomach in both cases was little more than about half full.

From these experiments, it appears, that the division of the eighth pair of nerves produces *paralysis* of the esophagus, in consequence of which it is incapable of conveying food into the stomach. It is stated by BRACHET, that the distention of the esophagus is owing to the animal having *lost the feeling of satiety*, so that it continues to eat

until it has filled both it and the stomach. The fallacy of this opinion was easily exposed by allowing the rabbits to have nothing to eat for twelve or eighteen hours previous to the experiment, in which case, after the division of the nerves, the esophagus, as I have before stated, was found invariably distended, though the stomach was frequently little more than half full ; it appeared, moreover, by giving the rabbits before and after the experiment two different kinds of food, that what was taken subsequently never entered the stomach.

II. The connection of the brain and the stomach by means of the par-vagus, is supposed to explain many sympathetic actions in both organs. Inebriety is said by some physiologists to arise from a peculiar condition of this nerve in the stomach, in proof of which it is asserted, that a few drops of liquor ammoniæ, before the absorption of it can possibly have taken place, quickly remove intoxication.* This opinion, however, is by no means satisfactorily established. It has not yet been

* C'est aussi par les nerfs pneumo-gastriques que s'expliquent les effets souvent singuliers de la réaction de l'estomac sur l'encéphale, effets sympathiques qui jouent un grand rôle dans les maladies, et auxquels on a peut-être trop accordé dans ces temps derniers. Voyez seulement ce qui se passe dans l'ivresse, et vous y reconnaîtrez l'effet de l'action du nerf vague, bien plus que de l'absorption du liquide spiritueux. L'ivresse a lieu avant que l'absorption ait pu se faire ; ce qui le prouve, c'est l'effet presque subit de l'ammoniaque liquide, chez un homme ivre. Faites-lui prendre quelques gouttes de cet alkali dans une verrée d'eau sucrée, l'ivresse disparaît presque subitement et comme par enchantement. Le vin n'avait donc agi que sur les nerfs

proved that intoxication depends on any condition of this nerve, or indeed, exclusively on any part of the nervous system. The fact may be otherwise explained. It is a perfectly gratuitous assumption, that the alkali employed operates before it could be conveyed in the course of circulation to the brain. In the experiments which I made, in order to ascertain how far this assertion was correct, the remedy, in no case, produced the desired effect instantaneously, meaning by this term, a few seconds of time. Even in the most favourable cases, a minute or two elapsed before any improvement took place, and in others a much longer period, half dram doses in water being given every five minutes, for several times, without producing any salutary change, which, indeed, sometimes never occurred at all, especially when inebriety had existed many hours, or, for two or three days in a greater or less degree. There is amply suffi-

vagues; c'est également sur eux que l'ammoniaque a dû agir. Autrement ces phénomènes seraient-ils explicables?—

Tous les jours nous voyons de mauvaises digestions causer des maux de tête violens. Tous les jours nous voyons des amas de bile ou de *saburres* dans l'estomac, causer des migraines intolérables, qui ne se dissipent qu'avec l'évacuation de ces matières par le vomissement, etc. etc.—*Recherches Expérimentales sur les Fonctions du Système Nerveux Ganglionaire*, p. 187.

cient time for the remedy to be absorbed and conveyed to the brain before its effect takes place, and this seems the justest mode of explaining its salutary influence, because, by absorption, it would act simultaneously on the whole of the nervous and sanguiferous systems, both of which are manifestly excited.

Inebriety is sometimes instantaneously cured by fear, in which case it cannot be supposed to arise from any change in the functions of the brain produced by the nerves of the stomach, and it is equally improbable, that the mental impression acts directly on these nerves, causing that peculiar condition of them which is said to explain the extraordinary action of ammonia. Intoxication, as previously observed, is characterised by great excitement of both the nervous and sanguiferous systems, and as fear occasions great depression of the vital powers, its sudden removal probably arises from the communication of this depression to the cerebral organs.

III. The process of secretion has been supposed by some to depend on nervous influence, and the truth of this opinion was apparently proved by the experiments of WILSON PHILIP,

but subsequent experiments have shewn its fallacy. In several parts of his Treatise on the vital functions, his views on this subject are distinctly stated, but especially in this passage :—" Does it not seem a necessary inference from the preceding experiments and observations, that in the functions of secretion, the vessels only convey the fluids to be operated upon by the nervous influence ? Thus we have every reason to believe, that the vessels of secretion, like those of circulation, are independent of the nervous system ; secretion failing when the influence of this system is withdrawn, not because the vessels of secretion fail to perform their office, but because the necessary changes on the fluids which they supply, no longer take place. We know that the nervous power occasionally influences the vessels of secretion, as we have seen it does those of circulation, because affections of the mind frequently occasion an increased flow of fluids to secreting surfaces. The vessels of secretion, therefore, thus far obey the same laws as those of circulation ; they are independent of, but influenced by the nervous power."*

* An Experimental Inquiry into the Laws of the Vital Functions.
—page 128.—See also, page 125—170.

The division of the eighth pair of nerves was, then, supposed to arrest the function of digestion, because the influence of those nerves was withdrawn from the stomach; it has, however, been fully proved in the “*Experimental Inquiry*,” that the suspension of the digestive function is not produced by this cause, but by the disturbance of the circulatory system, for when the natural conditions of this system were maintained on the division of the nerves in question, the function of digestion still continued to be properly performed. Hence it appears, that the nervous connection between the brain and the stomach is not essential to the process of secretion.

IV. It has been further stated that “* the effects of a section of the par-vagus are owing, as BRACHET has shewn, and as is believed by LEGALLOIS and DUMAS, not so much to a deficiency of action in the blood as to a paralysis of the muscular fibres of the bronchia and air cells, the existence of which fibres has been proved by RESSESSEIN ;—a paralysis preventing the expulsion of the blood and mucus.

* A Treatise on Physiology applied to Pathology by F. J. V. Broussais, M.D.—Trans. by John Bell, M.D. and R. La. Roche, M.D.—Page 598.

which accumulate in and block up the cells, and thus prevent the free circulation there of the blood sent for oxygenation."

The existence of muscular fibres in the cells of the lungs is no evidence that their power of contractility is derived from the parvagus, or that they are paralyzed on the division of this nerve. No fact, indeed, is adduced to prove that any such paralysis takes place, and it is an entirely gratuitous assumption to suppose that it does. The supposition is founded on the air-cells having been observed to be blocked up with mucus in cases in which the nerve was divided, but this does not at all prove its accuracy. In many of my experiments on this subject, no such condition of the lungs was produced by the division of the par-vagus, when *the respiratory function was strictly secured by the introduction of a tube into the trachea*. Whenever the regular performance of this function was disturbed, the lungs became congested with blood and mucus, *simply because the distribution and the qualities of the blood were disordered*. This condition of the lungs may be easily produced without the nerve being divided, and whilst, indeed, it is entirely unaffected, by rendering the entrance of air into the lungs

imperfect, as on the division of the nerve alone : nothing more is necessary to demonstrate the fallacy of the opinion respecting the paralysis of the lungs.

V. The process of chymification is accomplished by the action of the gastric juice and the various contractions of the stomach ; by these contractions the food is successively presented to the surface of this organ to be fully acted upon by its appropriate secretion, previous to its being gradually conveyed into the duodenum. These important changes being interrupted, on dividing the par-vagus, it has been asserted by many physiologists, that this nerve is the cause of the muscular contractions of the stomach, and that their being paralyzed by the operation is the cause of the suspension of digestion. Many experiments are adduced in corroboration of this opinion. In those performed by BRACHET, in which the brain was removed, or in which large doses of opium were given, food was scarcely at all changed in the stomach, from which it was inferred that the muscular fibres of this organ were paralyzed by the withdrawal of nervous influence. This conclusion seemed to be strongly corroborated by the striking fact, that

galvanism, employed under these circumstances, restored the function of digestion, which it was supposed to do by exciting the suspended muscular contractions. By these experiments, however, the natural condition of respiration, and consequently that of the circulatory system, were disturbed, without the perfect co-operation of which digestion must necessarily be disordered or arrested, as I have clearly proved in the "Experimental Inquiry," in which it is shewn, that when opium is given to produce decidedly sedative effects, respiration becomes slow and imperfect, and the chemical changes in the lungs consequently fail to be properly performed,---a fact which is unequivocally proved by the diminution of the animal temperature during life, and the highly congested state of the viscera discovered on dissection.

Galvanism removes this congestion, and thus enables the vital organs to perform their various important operations : as is evident from the effects produced by its application, the laborious breathing being gradually relieved, the animal temperature re-established and the internal organs freed, as they are found on examination, from that engorgement invaria-

bly existing in those cases in which this powerful agent has not been employed. With these strong facts, then, before us, it would be highly unphilosophical to contend, *that paralysis of the muscular fibres of the stomach is produced by the division of the par-vagus, or that this is at least the cause of the suspension of digestion.* This function may be arrested by depressing emotions and the application of cold, as may be easily proved by experiments on rabbits. It will scarcely be supposed that, the par-vagus is particularly influenced by the application of cold? The whole of the animal system is, however, affected by the inward determination of blood and the deterioration of its properties, so that when greatly depressed by cold the circulatory system is almost as unfavourably circumstanced, for the vigorous performance of its functions, as when the vital powers are depressed by opium.

VI. It is contended by some physiologists, that the eighth pair of nerves perform other functions than those already enumerated. They are considered the medium of communication between the lungs and the brain, transmitting to this organ the sensation of the want of air. The accuracy of this opinion

is, however, questionable, for direct experiments prove, that respiration continues, and that it is sometimes but little affected when these nerves are cut, providing the ingress of air into the lungs be secured by the introduction of a tube into the divided trachea. That respiration is not much, if at all, disturbed by the division of the eighth pair of nerves, is further proved by the fact, that the temperature of the animal is undiminished after the operation. Were the temperature reduced by this division many degrees below its natural warmth, it might then be asserted, with seeming truth, that these nerves perform the function attributed to them, but no such reduction taking place, there seems little reason for supposing that they perform any such function. There is, indeed, no evidence whatever of their doing this in the ordinary condition of the animal system, or under any other circumstances.

If the foregoing remarks and experiments be admitted, as satisfactorily proving that these nerves are not essential to the performance of the various functions which have been attributed to them, we must next enquire, what is the real nature of their action ? If it be stated

that they are solely for the purpose of communicating motion, it may, perhaps, be urged as an objection to the reasoning previously employed, that, in that case, there is no just ground for denying them to be the cause of the contractility of the muscular fibres of the stomach, or of the air-cells. Experiments, however, clearly prove, that the division of the eighth pair of nerves does not destroy the contractility of these fibres; since the lungs and the stomach continue to perform their functions long after this operation. The organs in which this contractility resides derive nervous energy from other sources besides the eighth pair of nerves, and this power, for any thing we know to the contrary, may depend less on such influence than on the inherent and independent properties of the muscular fibres themselves. Admitting that the par-vagum excites motion wherever it is distributed, the degree which it produces in many organs may be so trifling that no serious and immediate injury may be occasioned in the vital operations of the system by the division of the nerve. Its chief function may be to associate in harmonious action various parts of the animal frame, so as to secure its permanent well being, though this association may be of such a nature as

not to be immediately apparent on its interruption. All opinions on this subject are purely conjectural, and are not, moreover, necessary to establish the correctness of the reasoning employed in these pages, as it is founded on facts and experiments, the validity of which cannot be affected by our ignorance of the mysterious action of the eighth pair of nerves. It is sufficient to have shewn that the functions which have been attributed to these continue to be regularly and efficiently performed in organs deprived of their direct influence.

Few parts of the nervous system are more difficult to investigate than the sympathetic nerve. Its situation and intimate association with the cerebral and spinal nerves, render it scarcely susceptible of experiments, sufficiently direct to admit of decisive conclusions being drawn from them ; a circumstance which fully accounts for the various opinions respecting its origin and functions entertained by the first physiological authorities. One writer states that it arises from the sixth nerve, and from the Vidian branch of the fifth.* Another, with great plausibility, endeavours to

* Mayo, p. 340.

shew that it terminates at these points, and originates in the spinal cord.* A third contends that it is connected only by its branches with the spinal marrow.† A fourth regards its numerous ganglia as isolated centres of a nervous system, possessing communications with both the brain and the spinal cord, but springing from neither of these organs.‡ The supporters of these different views endeavour to shew, that their respective opinions are strongly corroborated by anatomical, physiological and pathological facts. It appears to me, however, that some parts of the subject do not at all admit of positive evidence, and that others are of so intricate a nature, that, in regard to them, we can make only a distant approximation to truth. An examination of the nervous system in a perfect condition cannot possibly enable us to determine the origin of the sympathetic nerve : we might as reasonably attempt to discover the beginning or end of a circle. The connexions which this nerve exhibits with the cerebral and spinal nerves, cannot be shewn to be formed by its own branches subsequent to the evolutions of the brain and spinal cord—if it were capa-

* Wilson Philip. p. 179. † Lallemand, p. 81. ‡ Bichat, Vol. I. p. 220, 221, 222.

ble of being demonstrated that they were thus formed, this fact would prove the independent existence of the nerve : nor can it, on the contrary, be shewn to arise from the gradual growth of either of these organs, in which case it would not be difficult to assign its origin.

Two very different views have been taken of the development of the nervous system. According to TIEDEMANN, the nervous apparatus is evolved from the centre to the circumference ; according to SERRES, from the circumference to the centre ; so that the light which might be thrown on the origin of the sympathetic nerve by either of these views, if clearly established, is totally obscured by their direct opposition. According to one, in cases of monstrosity which are destitute of both brain and spinal cord, but furnished with the ganglionic system, the nerve in question would be regarded as having an independent existence, since otherwise it would have been found absent ; but according to the other, this would not be a legitimate inference, as the brain and the spinal cord are supposed to be evolved subsequently to the formation of the nerves, and, to arise from them.

ACKERMAN and MALPIGHI assert, that the cardiac ganglion is the part of the nervous system which is first observed, and that it is quickly succeeded by the rest of the ganglionic system, and they, therefore, argue that this system is essential to the incipient functions of organic life, being in many cases the only portion of the nervous apparatus found existing. It is, however, stated, and the observation seems highly credible, that in many of these cases, there are facts which seem to prove, that the brain and spinal cord have been destroyed by disease or some extraordinary change in the elements of the embryo, and that they may consequently have, at some previous time, exerted an influence which after their destruction, it is not in our power to determine. Recorded cases, however, have occurred, in which the absence of these organs must be attributed to some original defect in the laws of vitality.

No farther evidence than this fact, if it be well established, is required to prove, that the ganglionic system is alone necessary to the well-being of the fœtus; for whatever influence it may derive, after birth, from its connection with the brain and spinal cord, it

is unquestionably capable of generating nervous properties amply sufficient for organic life, and it must, therefore, under these circumstances, be regarded as a perfect and independent system. It is, perhaps, difficult to determine with equal certainty, whether the ganglia severally be, as some physiologists have imagined, independent centres in themselves. This opinion is however extremely probable. The first evident pulsations of the heart are coetaneous with the cardiac ganglion, being apparent before the numerous ganglia constituting the sympathetic nerve are completely formed; and these pulsations continue, however imperfectly developed or severely injured by disease the remaining parts of the nervous system may be. Unless the ganglia be regarded as possessing independent powers, the brain, or the spinal cord, must be considered as the source of their energy; but this cannot be admitted, because they are found in vigorous operation when these organs are altogether wanting. The generally ascertained functions of the cerebro-spinal apparatus do not appear to be at all necessary to foetal existence. The intimate connections formed with this apparatus by the sympathetic nerve are for the purpose of maintaining relations and minis-

tering to powers evolved only at birth ; the seeming complexity of these connexions is therefore intended to answer ulterior and not immediate ends. On this principle we may, perhaps, satisfactorily explain the functions and origin of the sympathetic nerve. It does not appear just to consider it as arising either from the brain or spinal cord, if that portion of it strictly belonging to foetal existence be regarded as part of the nerve, which is stated by high authorities to be first formed ; and, indeed, if it be examined in all its complex relations to a more perfect state of being, the whole nerve cannot be looked upon as springing from the cerebro-spinal apparatus, *but only that part of it which is evolved to maintain these complex relations.* Hence the sympathetic nerve may be said to have as many origins as it has distinct connections with the rest of the nervous system, keeping, however, in mind, that the greater part of it has an independent existence, viz.,—*that part which is always found even in the least perfectly constituted foetus, and which, in the confined sphere of its being, is alone necessary.* Its numerous connections with the brain and spinal cord, but especially with the latter, afford an abundance of nervous energy appropriated to the purposes of motion and

sensibility, which its own independent system is altogether inadequate to supply; and it is in consequence of such connections becoming more intimate and various in the ascending scale of animal life, as well as in beings of the same species, in passing from birth to a fully matured age, that any injury inflicted on these organs is liable to destroy or severely implicate the vital functions. The connections thus established, not only afford the viscera additional nervous power, but likewise become the media by which morbid impressions are transmitted to the sensorium, rousing it to a consciousness of existing mischief, or otherwise affecting its sensibility. The ganglia of the sympathetic nerve are considered by many as rendering the important actions of organic life independent of volition. There are no experiments which prove this, nor is the reasoning adduced in its favour in any degree supported by facts: but there can be no doubt, that such actions are not under the direct influence of the mind, though it must be acknowledged that the cause of this independence is involved in mystery.

There are other facts, besides those already mentioned, which seem to prove that the

ganglia, whatever be the exact nature of the offices performed by them, are very intimately concerned in the functions of organic life. They are larger, compared with the rest of the nervous system, in the inferior than the higher classes of animals—in idiots than in persons of sound understanding, and in childhood and youth than in decrepit old age. The functions of organic life are extremely vigorous in all cases in which the ganglia are more fully developed, and it therefore seems not improbable that the greater activity of the former arises from the larger development of the latter ; though, at the same time, it seems likely that a portion of this development is attributable to the energetic actions performed by them. The law which explains the growth of the heart or the lungs in persons of active habits, applies, also, as justly to the enlargement of the ganglia themselves : *the more excited their actions the greater their development becomes.* From the limited sensibility exhibited by the abdominal viscera in a state of health, it is natural to infer that the sympathetic nerve is not endowed with a high degree of it, and in corroboration of this inference, it may be shewn *that it is more extensively associated with the anterior roots of the spinal nerves which ex-*

excite motion than with the posterior which excite sensibility. The constant contractions of the heart, and of several of the abdominal viscera, require that these organs should be abundantly furnished with nervous energy exciting motion, but not equally with that exciting sensibility, as the latter is by no means so necessary to enable them to perform their proper functions. The distribution of the cerebral nerves, and their connection with the sympathetic nerve, explains the acute sensibility which the abdominal viscera occasionally manifest in disease, as well as the reciprocal influence which they exert on each other: it is not, however, improbable that this reciprocal influence has been used to explain phenomena which are justly referrible to other cases.

BROUSSAIS endeavours to shew that sleep is the consequence of modifications produced in the actions of the brain by the sympathetic nerve, which he infers from what he supposes to take place in bodily fatigue; this being, according to his statement, “followed by cerebral engorgement,” which he attributes “to the great sympathetic, because it depends on a modification of the viscera. In fact, “he continues, “this modification acknowledges,

as a cause, the painful sensation of fatigue. Now this sensation is reflected, like all the others, into the viscera ; the great sympathetic is of course affected ; it reacts then on the brain ; and to its influence is owing the engorgement of this organ, which produces the impossibility of innervation of the locomotive muscles, and finally, sleep." He further remarks, " I have reasserted that the immobility necessary for sleep was the product of cerebral engorgement : would it be going too far to attribute it to the cords of the great sympathetic, which penetrate the cerebral substance with the arteries ? It seems to me that these nerves, taking on, at this time, excess of action, must draw the blood towards the capillaries of the brain, and from this congestion results at the same time the repose of the locomotive muscles, and the augmented action of the orbicularis of the eyelids, the office of which is to withdraw the eye from the stimulating impression of the light."*

The supposition is not more bold than improbable, that the engorgement of the cerebrum is the effect of the stimulating influence of the sympathetic nerve. Such influence

* Treatise on Physiology applied to Pathology, p. 275.

would be more likely to retard than to promote sleep, and it has moreover been ascertained from experience, that a wakeful state of mind is produced by many diseases and remedies *which increase the action of the capillaries of the brain*. There appears, indeed, to be no just ground for believing that the nerves take on at this time, excess of action; but even supposing them to do so, they would certainly tend to excite those organs with which they are directly connected, equally at least, and probably to a much greater degree than others, with which they are only indirectly associated; but it is an undoubted fact, that the heart and the lungs act less vigorously in sleep than in a state of wakefulness. The cerebral engorgement following fatigue, may be explained without referring it to the direct influence of the sympathetic nerve. All muscular exertions enfeeble the animal system by the exhaustion of its vital energies: and when this is considerable, the internal organs necessarily lose some portion of their vigour, so that the blood is propelled neither with its usual force, nor in its ordinary quantity, from the centre to the circumference of the body, in consequence of which the brain, as well as all other important viscera, are liable to be con-

gested, independent of any peculiar influence being exercised by the sympathetic nerve.

Should it be contended that the congestion arises from some extraordinary modification produced in the nerve, by the exhaustion, it appears to me more reasonable to regard this modification rather *as a diminished than increased action*: since an increase of action would have a tendency to prevent the very effect which takes place. According to the hypothesis of BROUSSAIS, nervous energy must be considered not as invigorating but enfeebling the capillary circulation, as the latter is supposed to become *more languid in proportion to the increased vigour of the former*. Fatigue may arise from other causes besides muscular exercise, as from deep and continued thought, or close application to any sedentary pursuit. In cases of this kind, the internal engorgement which succeeds lassitude cannot justly be attributed to an excessive impoverishment of the system, such as occurs after violent exercise, because the excited action of the functions which occasion this impoverishment in the one instance, does not exist in the other. There is undoubtedly a certain degree

of it ; but the fatigue which is felt is not so much caused by this as by the constrained position of the body, and the want of muscular motion essential to the healthy distribution of the blood, and the vigorous performance of the numerous vital actions.

Is it just to imagine that the sympathetic nerve is the only part of the system primarily affected by such causes ? An enlarged view of the constitution of the animal economy will teach us to regard the primary effects as much more general, and hence enable us to form a correct idea of the nature of fatigue. It is not my intention in this place, however, to examine the phenomena of sleep, nor to propose any theory respecting it. This subject, so replete with speculation, has little or no connection with my present enquiries. LOBSTEIN has some peculiar views on the nervous system which it would be improper to leave unnoticed here, not only because they directly bear on some important subjects which remain to be discussed, but, also, because they are stated in a very plausible and ingenious manner, and possess, moreover, a high authority from the well known abilities of the author who supports them.

The undue influence which this distinguished writer attaches to the nervous system is evident in every part of his valuable work.* Any decrease or diminution of an organ, or derangement of a function, is almost invariably referred by him to primary modifications occurring in the nervous system, which, however, he by no means distinctly defines, nor shews how they can effect any practical improvement in the principles of treating disease. There can be no doubt, that, in many of the cases to which he alludes, the nervous system is diseased, but, he fails to prove that it is primarily affected, or that it produces the various morbid phenomena co-existing with it. In acute inflammation, when the circulatory apparatus is much excited, he represents the nervous fluid, supposed to abound greatly at this time in the blood, as the cause of its expansion and vigorous motion; and to the escape of this fluid, in venesection, he refers the sudden improvement sometimes observed in the symptoms of the disorder.†

* *Traité d'Anatomie Pathologique.*

† Dans les fièvres et dans les maladies inflammatoires aiguës ces deux espèces de pléthore, la *nerveuse* et la *sanguine*, se confondent. Il n'en résulte pas seulement un mouvement intime des molécules du sang, celui-ci acquiert en outre des qualités plus *vitales*. La surface

It has been shewn in the “Experimental Inquiry,” that, whenever the blood acquires additional stimulating or vital properties in disease, or in health under peculiar conditions, it arises from the chemical changes in the lungs

interne des cavités du cœur est plus énergiquement stimulée, sa réaction devient plus forte, et ne cesse ordinairement qu’après une copieuse saignée. Comment arrive cette détente subite? Comment se calme instantanément le système prodigieusement exalté? C’est qu’outre la soustraction du sang, on a ouvert une voie de décharge au principe nerveux surabondant, précisément comme si on eût pratiqué une saignée aux nerfs eux-mêmes. Ces considérations, par lesquelles nous expliquerons plus tard ces crises miraculeuses, opérées quelquefois dans les fièvres cérébrales par une légère hémorrhagie nasale, sont encore puissamment fortifiées par les expériences de Th. R. TREVIRANUS, desquelles il résulte que le sang est doué d’un mouvement propre et intrinsèque, indépendant de l’action du cœur et des vaisseaux; mouvement soumis à l’influence du système nerveux et notamment de la moelle de l’épine.—P. 171.

C’est ainsi que les fièvres synoques paraissent produire dans le sang un mouvement intrinsèque plus rapide. Ce n’est point à l’action lente de la nutrition, ni à la composition ou à la décomposition chimique, que sont dus ces résultats; mais à une influence plus prompte, plus instantée et plus vitale. On dirait que dans ces cas le principe nerveux se mêle avec le sang et entraîne avec lui la vie de l’individu.

Lorsque ce principe ne s’échappe que partiellement avec le sang, il en résulte dans l’économie animale un bien-être marqué; parce qu’alors le ton du système nerveux est ramené à son type normal, et que les mouvemens vitaux qui étaient en désharmonie, se mettent en équilibre; voilà ce que j’appelle une crise par hémorrhagie. Ce n’est pas par la quantité de sang perdu que la santé se rétablit, car elle est quelquefois insignifiante; *c’est parce qu’il y a eu évacuation d’une certaine portion du principe nerveux qui tenait le système dans un état d’excitation contre nature.* P. 215.—*Traité d’Anatomie Pathologique.*

being augmented. This opinion is founded on numerous facts and experiments, the accuracy of which can scarcely be called in question. The expansion and greatly accelerated motion of the blood never occur but when its properties are modified in the manner stated, and there is not a single circumstance which can be regarded as strongly corroborating the hypothesis of LOBSTEIN. The effects produced on the sanguiferous system by venesection are not, it is well known, proportionate to the quantity of blood withdrawn; nor is there any evidence to prove that they are modified by a more or less abundant evolution of the nervous fluid, *since the same effects often succeed the application of remedial measures which cause directly no diminution in the circulatory mass.* Cold affusion, as well as emetic tartar, occasionally reduce the bounding pulse in inflammatory affections as effectually as bleeding itself, and it will hardly be contended, that the beneficial influence of their operation is attributable to the loss of nervous fluid. The same general principles, which may justly be adduced to explain the action of any one of these remedies apply as forcibly to the rest. In all acute inflammations the blood is too vitalized for the well-being of the animal system;

therefore, to lessen its vitality must be the object of all correct treatment : *but this can be accomplished only by circumscribing within narrower limits the chemical changes in the lungs—an effect which may be produced by any measure that causes the whole mass of blood to pass in a given time less frequently through these organs.*

A small quantity of blood abstracted when the body is in an erect position is universally known to be productive of more decidedly sedative effects than the loss of a much greater quantity when the patient is recumbent. According to the views of LOBSTEIN would not this be explained by the supposition that the nervous fluid in the former instance escapes in greater abundance than in the latter : how else, indeed, could it be accounted for, since it is distinctly affirmed, *that this fluid must be removed to allow the undue excitement of the vital powers to subside ?* It is scarcely necessary to add, that such an explanation, though entirely consistent with his principles, would be considered very extraordinary and unsatisfactory.

As the nervous fluid is incorporated with the blood, it seems natural to suppose that the quantity evolved of the former would be proportionate to the loss of the latter : there must,

then, be an absolute necessity for the withdrawing of much blood in acute inflammations, in order to remove that subtle agent, which is said to exercise so baneful an influence, but no such absolute necessity exists ; the essential modifications in the sanguiferous system being often produced by remedies which *change only the distribution of the blood*. What becomes of the superabundant nervous fluid in all such cases ? Venesection performed in the erect position soon excites faintness or syncope, a circumstance which satisfactorily accounts for its success, since the chemical changes in the lungs are diminished by the inordinate quantity of blood which is thus determined to them.*

The strikingly beneficial, or injurious, effects which frequently succeed the loss of a small quantity of blood, may, in most instances, be explained on this principle, though the former are often to be attributed to the relief which such loss affords to the locally congested vessels. In further confirmation of LOBSTEIN'S peculiar notions on this subject, and of the limited views which he too frequently takes of the vital powers, the following passage may

* See " Experimental Enquiry," Chap. XIV

be adduced :—" Depuis des siècles on se demande pourquoi les violens mouvemens de la poitrine donnent la pleurésie ; pourquoi le travail de l'accouchement est quelquefois suivi de péritonite : quant à moi, je ne serais nullement surpris que les nerfs costaux, diaphragmatiques, lombaires et sacrés, si violemment ébranlés, n'influassent sur les membranes séreuses qui les recouvrent, n'augmentassent leur *température vitale*, et n'y fixassent la cause première de l'inflammation."*

In the attempt to explain the origin of the diseases, mentioned in this passage, LOBSTEIN seems never once to have considered, that the excited motions of the chest, or the distended and subsequently sudden collapse of the abdomen, might be sufficient causes to produce a direct modification in the distribution and qualities of the blood, and thus to occasion inflammation. Instead of these intelligible causes, which he entirely overlooks, others are sought for in the nervous system, which admit only of conjectural evidence. The invigorated motions of the chest are apt to produce pneumonia and pleurisy, by exciting the capillaries of the respiratory or-

* *Traité d'Anatomie Pathologique*, p. 253.

gans to inordinate action, giving them, in fact, a highly vitalized condition, which renders them extremely susceptible of the influence of cold on the cessation of such motions—and consequently liable to congestion—the immediate precursor of inflammation. If the condition of the peritoneum immediately before and after child-birth be considered, the occasional occurrence of inflammation in it will not appear remarkable, being the natural consequence of the very different circumstances in which the capillaries of this membrane are placed at these two different periods. In the former period, they must necessarily have an action peculiar to the extraordinary expansion of the membrane, which action, in the latter, will be greatly modified by the sudden return of this membrane to its natural state: hence, as it is scarcely possible that these vessels can immediately adapt themselves to new and important conditions, congestion is almost certain to follow, and, if not removed by the gradually increasing energies of the constitution, is soon converted into inflammation. This is a simple and intelligible explanation of the phenomena. The causes specified can be shewn to exist, and the effects which are stated to succeed

their operation, must be admitted to be unavoidable. The view of the animal system, which we derive from a knowledge of these causes, can scarcely fail to suggest ideas of great practical importance, but can any such be traced to the peculiar doctrine of LOBSTEIN?

The apparent expansion of the blood in active inflammation he attempts to account for by the addition of the nervous fluid, which he imagines to abound greatly in that state. He was compelled to adopt this opinion in order to explain the seeming augmentation of the mass of blood—an augmentation which he could not regard as real in consequence of its taking place in so short a time. To understand the striking changes which the circulatory system undergoes in acute inflammations, it is only requisite to consider the *alteration in the distribution and chemical properties of the blood*. In the healthy and unexcited state of the body, this fluid is chiefly found in the internal organs. When inflammation takes place the energies of the circulatory system are roused, so that the blood is more equally diffused, and in consequence of its undergoing extensive chemical changes in the lungs, its general diffusion is continued: hence

it appears greatly augmented, when it is in reality augmented only in a slight degree. The increased chemical changes will, perhaps, be admitted as adding something to the mass of blood, unless it be supposed that it loses as much as it acquires in becoming highly oxygenated. However this may be, it can scarcely be doubted, that its seeming augmentation arises principally from important modifications in its distribution and properties : this opinion is rendered highly probable by the beneficial operation of certain remedies, which establish the original condition of the blood, not by directly diminishing its quantity, *but by restoring its natural distribution.*

It is scarcely necessary to make any further animadversions on the peculiar doctrines of LOBSTEIN, though I would just allude to one of them being, moreover, maintained by other authorities, viz. : that the attenuation of paralyzed limbs arises from the deficiency of nervous energy. It seems to me more probable that it arises from a deficiency of blood. The circulation of this fluid in the extremities manifestly depends on two causes ; *the action of the heart, and the muscular motions of the extremities themselves* : hence, if the in-

fluence of the latter be subtracted from the powers usually in operation, it is easy to conceive that less blood will be sent to them than they receive in a state of health, and that their vital actions will, in consequence of this deficiency, be proportionately limited, a supposition which satisfactorily accounts for the diminution of both their hard and soft parts. The upper extremities occasionally suffer a very marked attenuation on dislocation of the humerus, or fracture of the clavicle, and the attenuation, LOBSTEIN attributes to the brachial plexus of nerves being severely injured by the accident.* It is, however, very evident, that the long and entire rest from muscular motion, which the extremities often require under such circumstances, will itself inevitably lead to their attenuation by depriving them of their ordinary supply of blood. It may, perhaps, be said, in defence of the hypothesis of LOBSTEIN, that the nervous fluid is less abundant in proportion to the less quantity of blood transmitted to the extremities ; but this is not his own mode of defending it. His opinion is, that the paralysis which takes place in the nerves, or the injury which is done to them, imme-

* *Traité d'Anatomie Pathologique*, p. 92.

diately *produces a change in the vital actions of the parts over which the diseased portion of the nervous system presides.* This distinguished physiologist attempts to account for many other phenomena on the mysterious influence of the nervous fluid ; such as defective secretion, change in the properties of the blood in fevers, and a very marked alteration in the qualities of the milk in the breast on sudden fright or grief, all of which, however, admit of the most satisfactory explanation, on the same simple and intelligible principles, as have been already proposed.

SECT. II.

Irritability of the Nervous System, arising from, or associated with actual exhaustion of the animal frame.

THERE is great discrepancy of sentiment respecting the nature of many diseases included under the head of gastro-enterite, or nervous irritability of the digestive organs—terms frequently employed by different writers to designate the same disorders. It is contended by some that the maladies thus designated, are always to be traced to inflammation, whilst others attribute them to functional derangement, chiefly, if not altogether, dependent on a peculiar state of the nervous system. The treatment suggested by these different views is, of course, proportionately various. A laborious investigation of this subject has long convinced me, that in each of these opinions there is much truth blended with a great deal of error, which is necessarily productive of much

mischief. In numerous instances both morbid conditions exist, and a correct appreciation of their symptoms cannot fail to lead to a knowledge of the general state of the animal system, in which they in common frequently originate, as well as to a discrimination of the preponderating causes that appear to create only one of the conditions, when, perhaps, both are too intimately connected with the true, though latent source—structural modifications—to admit of an easy or just separation. The prevailing defect in the opinions just stated, is the confined view which the supporters of them take of the seat of the diseases investigated, restricting them to particular organs, and to a peculiar state of them, when there is a general derangement of the vital powers, which is not, perhaps, so much the effect of the existing local diseases, as the cause of it. The consideration of this subject is instituted principally for the purpose of pointing out, in the morbid conditions previously mentioned, distinctions of the greatest possible importance affecting the treatment of them, but, only a brief notice of those distinctions will be taken here, as they will be examined more at length in a subsequent part of this Work.

The nervous system, intimately concerned in the digestive functions, is liable to be disordered by numerous causes, some of which appear to affect it exclusively, others in conjunction with the rest of the animal economy. Emotions of the mind are frequently adduced by distinguished writers as illustrative of disease of the nervous system existing without inflammation, and, therefore, requiring an invigorating, and not a debilitating mode of treatment: but it is only an accurate knowledge of the general condition of the vital powers during the existence of such emotions, which can suggest a judicious line of practice. The symptoms accompanying mental depression necessarily vary according to its degree, and the susceptibility of the vital powers. In many instances in which this susceptibility is by no means great, but the depression severe, there is almost invariably loss of appetite, pain about the pit of the stomach, a white tongue, a pulse rather frequent and small, or if, as it is occasionally, somewhat full, always soft; the extremities are cold, there being great deficiency of animal heat in the body, the bowels are very liable to be constipated, and, when moved, the evacuations are small in quantity and dark coloured, never copious or

of natural appearance. The digestive organs appearing chiefly disordered, to correct them is generally the object of the different modes of treatment adopted, which are extremely various, the symptoms being supposed by some to arise from inflammation, by others from a peculiar state of the nervous system. The former opinion is founded on the existence of pain about the pit of the stomach, and the great sensibility of this organ, as well as the relief occasionally succeeding the application of antiphlogistic remedies ; the latter, on the success of others of a nature directly opposite to this, and on the observation of phenomena which are stated to be very different from those characteristic of gastro-enterite. My own experience, which has been pretty extensive in cases of this kind, is decidedly in favour of the occasional employment of each mode of treatment, nor is it difficult to explain the beneficial influence of both. It is first requisite to determine the general state of the animal system, and then to institute a particular examination of the chylopoietic viscera. It is very obvious that the body has undergone great changes : having lost much flesh, the countenance appearing pale or somewhat jaundiced, the pulse

wanting its usual strength and fulness, and animal heat being less abundantly diffused. The blood abstracted at this time does not exhibit a healthy appearance, being thin, coagulating slowly and with a very loose crassamentum. From these general symptoms we are entitled to conclude, *that the irritability of the nervous system is accompanied with great exhaustion of the vital powers*, attended, also, with derangement of the capillary system, which will serve to explain the frequent success of different modes of treatment. The first effect of mental depression is to produce engorgement of the internal organs; but if the emotion continues until great emaciation occur, these organs generally become less congested *from the great diminution in the mass of the circulating fluid*: some of them will still, however, be liable to possess more than their proper quantity of blood, and others less, whilst its ordinary invigorating properties will, of course, be deficient in both. The circumstances which thus influence the distribution of the blood, *are the functions, structure and situation of the organs, and the qualities of the vital fluid*, which will be admitted to be in an impoverished state, as none of the important actions of the animal eco-

mony are vigorously or regularly performed : hence as it is not transmitted to the extremities and surface of the body with its usual force, it will have a tendency to accumulate in those viscera, the most favourably situated for its reception, viz., the liver, spleen and pancreas. In persons who have died of any disease induced by mental depression, one or more of these viscera will be found on dissection in an unhealthy state, though others may have been the cause of death. It was stated that some organs have less blood than in health : an effect which will be necessarily produced by *the great diminution in the mass of the blood, and the irregular distribution of the remaining quantity.* The alimentary canal, from the various functions which it performs, and the different situations which it occupies, particularly in relation to other organs, can scarcely possess, under these circumstances, one uniform condition throughout its whole extent ; some parts will probably be more vascular than usual, whilst others are much less so. The capillaries about the pyloric orifice of the stomach, will be liable to be somewhat congested in consequence of their immediate contiguity to the liver and spleen, in which the great disturbance of the circulation, will tend

to interrupt the free return of blood from these vessels.

It very rarely, indeed, happens that pain is not felt in this particular situation, when the abdominal viscera are disordered, whatever be the nature of the disease ; this pain being produced by the frequent occurrence of congestion, and the irritation which it excites in the numerous nerves distributed about this part. The pathological state of the capillaries in this situation will satisfactorily explain in what way opposite modes of treatment are often attended with great success.

The morbid condition of these vessels may be very different in different persons exhibiting the same general symptoms. In one it may be characterised by great congestion, existing, also, in the organs in the immediate vicinity of the stomach, to relieve which it may be advisable to apply leeches and restrict the patient to low diet ; in another, these vessels may be characterised less by congestion *than want of tone or vital energy*, so that to enable them to recover their ordinary functions, tonics and invigorating food may be essential. Those who almost exclusively sup-

port the former practice, contend that inflammation exists; those in favour of the latter assert, that it is not inflammation, but nervous irritability. The evidence adduced by both is chiefly derived from the results of the treatment pursued and the continuance of pain, each particularly alleging the latter symptom, as strongly corroborative of their respective opinions. The capillaries of the rest of the alimentary canal will be less liable to be congested than those belonging to the inferior portion of the stomach, as they are less subject to irritation than the latter which are constantly and directly acted upon by various injesta—a circumstance which can scarcely fail to cause considerable vascularity.

The bowels are mostly obstinate in cases of emaciation caused by mental depression, and could scarcely be otherwise, deprived as they are of their natural stimulus—abundant and healthy alimentary matter; of which the gradual diminution, supposing no disease to exist in the bowels, most probably occasions a proportionate change in the quantity of their circulating fluids, the quantity being determined by the action of the numerous capillaries belonging to them, which cannot, under these

circumstances, be supposed to be greatly excited. In confirmation of this reasoning, the alimentary tube, on dissection of such cases, is generally found more pale and exsanguineous in its appearance than is natural. Should it, however, be contended, that the quantity of the circulating fluids, appertaining to the bowels, is not influenced by the circumstances previously stated, nor at all diminished, it will scarcely be doubted that the capillaries are extremely deficient in vital energy in consequence of the deterioration in the properties of the blood, and the want of the usual stimulus of alimentary matter. If this very brief account of the condition of the digestive organs in the emaciation or exhaustion of the animal system, consequent on mental depression, be correct, the relation which the co-existing nervous irritability holds to this condition may be easily understood, and the knowledge of it cannot fail to be of practical value. It is not in the power of the pathologist to ascertain the precise nature of the affection producing irritability in the nerves, nor is it, perhaps, possible to trace the exact exciting cause, though it seems reasonable to refer it to *the morbid state of the capillaries, acting on nerves peculiarly susceptible of impression from*

their participating in the acute sensibility common at this time to the whole nervous system : but if a perfect knowledge of the nature and cause of nervous irritability cannot be obtained, an examination of the various morbid phenomena of the human frame co-existing with such irritability, may perhaps lead to information amply sufficient for the establishment of just principles of treatment. Intense application of mind very often causes great irritability of the nervous system, especially of the nerves appropriated to the digestive organs, accompanied, in some cases, with symptoms which indicate only a disturbed action of these important organs, in others with those characteristic of exhaustion of the animal system : its association with the latter will alone be considered in this place. It rarely happens that persons indulge in deep and long continued thought to the serious injury of the vital energies, unless they have been endowed by nature with faculties which almost involuntarily urge them to mental exercise, and hence such persons may with propriety be called *intellectual*—a designation, which, if sufficiently borne in mind, will frequently serve to explain phenomena that would otherwise be imperfectly understood. Some, though the number

is comparatively small, in whom severe mental application produces nervous irritability, possess robust constitutions, but in these the irritability seldom results from great exhaustion of the animal system, to which the intellectual, having lean and slender frames, and delicately poised powers of health, are peculiarly liable.

In persons thus constituted the nervous system has a preponderating influence, and is, therefore, readily excited by intense exercise of the mind, which can scarcely fail to cause considerable exhaustion of the animal frame, not only necessarily depriving it of a liberal supply of nourishment, but also preventing that which is taken, from being properly digested and assimilated, as the functions by which these changes are effected are imperfectly performed. From these circumstances the irritability of the nervous system, arising from intense application to severe studies, is frequently associated with great exhaustion of the constitution ; less, perhaps, in degree, and somewhat different in its nature, if a still further refinement in distinctions be admitted, than when produced by violent distressing emotions. In cases of the latter kind, the body is sometimes suddenly and greatly attenuated, exhibiting

undoubted evidence of an actual loss of the vital fluids, the irritability occasioned by which is in general strikingly characterised by a sensation of urgent prostration, or sinking of the energies of life. In those of the former, the exhaustion is less evident, yet it must be considerable from the operation of the causes previously alluded to, though the irritability connected with it is associated with less of the overwhelming feeling of depression : the nervous system, however, appearing much more tremblingly alive to painful impressions than in the cases in which it is affected only by mental emotions—a difference which is easily accounted for by the circumstance that in these the nervous system naturally predominates, whereas in the other, should it be equally predominant, it is purely accidental.

It must not be supposed that the exhaustion of the constitution, succeeding intense and prolonged study, is comparatively trifling, because its effects are not always strikingly manifest to common observation. The body, naturally lean and delicate, does not always admit of effects evidently apparent to the vulgar eye ; but on a close examination of those which invariably exist, it is generally found

that great debility pervades the whole animal economy. The stomach will bear only a small quantity of food at any one time, and even this produces acute pain or disagreeable sensations whilst the nature and irregularity of the evacuations clearly shew, that the rest of the chylopoietic viscera are equally disordered. The pulse is weak and frequent, indicating, in the most unequivocal manner, the great poverty of the vital powers. The tongue is only slightly furred, and this principally towards the root, unless the irritation of the stomach be severe or of long continuance, when it occasionally becomes red and smooth:—these symptoms are always unfavourable, as they too often indicate structural changes, tedious and difficult of cure.

The irritability of the nervous system is strongly excited by profuse evacuations, whether natural or otherwise, and the too frequent return of menstruation, or too copious a discharge at the proper period is a very common cause of it. It seldom occurs except in constitutions habitually delicate and weak, or in those debilitated by the want of sufficient nourishment, depression of spirits, sedentary pursuits, or long continued lactation. In such cases, the countenance is

pale and anxious, the pulse small and frequent, or, if not quicker than usual, always soft ; the extremities and surface of the body are acutely susceptible of cold, the digestive organs are much disordered, and pain is almost invariably felt on pressure being made at the pit of the stomach, if, indeed, it is not a constantly annoying symptom ; there is, also, generally great irritability of mind. A disordered state of the uterine functions is both an effect and cause of exhaustion. As the derangement of the vital powers, preceding the disturbance of these functions, occasions the deterioration of the blood and consequent irregularity of its distribution, an undue proportion of it is determined to the abdominal viscera, which, however, is not sufficiently invigorating to endow them with healthy action ; hence, the capillaries of the uterine organs pour out their contents too frequently or in too great abundance. The tardy or imperfect establishment of these functions in early life is, also, chiefly attributable to the causes already mentioned ; and the most effectual plan in restoring it is, that which gives tone and energy to the whole system. It requires no argument to prove, that the too frequent return of the catamenia as well as the too copious flow of them, will greatly

debilitate the body, or that the exhaustion thus occasioned is strikingly associated with nervous irritability. It has often been observed, that disorder of the uterine functions is mostly accompanied with this latter symptom, and this has commonly been said to arise from the necessity of their correct action to the well-being of the female constitution. This explanation is just as far as it proceeds, but it does not point out, with sufficient precision, the nature of the morbid effects produced, or the relation existing between nervous irritability, and derangement of the sanguiferous system. In the following Section, the disturbance of the uterine functions, in connection with other conditions of the animal economy, not here particularly specified, will be considered, in order that the various bearings of this important subject may be more clearly perceived.

Great nervous irritability is often observed in too prolonged lactation, or even under ordinary circumstances, when the maternal constitution is naturally weak. In many cases, the irritability is associated with less manifest general disorder of the vital organs than that previously described; the whole frame, how-

ever, being peculiarly alive to impressions, and strongly agitated by unexpected occurrences of the most trivial kind. The appetite is fastidious and delicate, though, very frequently, there is little or no pain in the stomach, nor is it particularly excited on pressure being made upon it externally. The tongue is clean with a slightly red appearance, the pulse is small and quicker than usual. The patient has a difficulty in fixing on any organ as the cause of the morbid feelings, and having no urgent pain in any part of the body, is unable to account for the most annoying symptom, viz. the want of sleep. This degree of irritability is almost entirely confined to females endowed with acute sensibility. Great exhaustion occurring in others, differently constituted, does not produce it, but, on the contrary, considerable depression of the vital energies generally, accompanied with very evident functional disorder of the chylopoietic viscera. The lower classes of society, being subject to severe privations and hardships, are more liable to these latter symptoms than persons enjoying the comforts or luxuries of life.

The loss of blood, whether caused by venesection or hemorrhage, is often obser-

ved to occasion great irritability of the nervous system. When the quantity abstracted during the progress of an inflammatory affection, is great, the excited condition of the nerves does not immediately occur, nor does it, indeed, shew itself particularly during the progress of the disease ; being most apparent near the period of convalescence, when the symptoms of nervous irritability are extremely distressing ; and both great experience and nice judgment, are requisite to the proper treatment of them. These symptoms, also, frequently occur, when venesection has been employed in cases in which the morbid phenomena depended rather on debility or want of tone, in the organs apparently diseased, than on inflammation, by which they are erroneously supposed to be produced. There are few practitioners who have not frequently witnessed the aggravation of disease under these circumstances. Severe pain in the head, occasionally so urgent as to induce an apprehension of cerebral congestion, (to relieve which, recourse is had to the free abstraction of blood either locally or generally,) is often rendered by it much more violent ; accompanied, too, by an increase of nervous irritability and great derangement of the digestive functions. In many of these

cases, it is extremely difficult to determine, exactly, the nature of the symptoms and the best mode of treating them. Symptoms of this kind can be understood only by those (and often, but imperfectly, even by the most intelligent) who have enjoyed many opportunities of comparing the perplexing indications of disease with others less equivocal, and have observed the results of the various means applied for their removal. How frequently, however, does it happen, that erroneous notions are formed, even by persons of the most matured experience, and energetic measures adopted which increase the evil they are intended to correct !

Whenever the predominating symptoms are characterised by nervous irritability, the abstraction of blood is almost invariably injurious, especially if they originate in debility, as they generally do in the most remarkable cases of this kind, though not, perhaps, in all. In some instances the prevailing excitation may seem purely the result of an undue action of the nervous system, produced by *invigorating* causes, as it is susceptible of being influenced by its own particular and appropriate stimuli, in as high a degree, indeed, as the

sanguiferous, or any other part of the constitution: but in most cases of irritability, there is, undoubtedly, considerable exhaustion of the vital powers. Delirium tremens may be adduced as peculiarly illustrative of extraordinary nervous excitation, and its dependence on, or, at least, co-existence with such exhaustion. It occurs, as is well known, in persons who indulge too freely in spirituous liquors, but persons of this depraved taste mostly neglect that mode of living which alone is capable of giving tone and energy to the constitution; or in those exceptions, (a few of which have fallen under my observation,) stimulants rarely give rise to any striking phenomena of irritability, a satisfactory proof that they operate much less injuriously on the nervous system, when the powers of life are maintained in healthy and vigorous action. In further confirmation of this fact, it may be remarked, that malt liquor, though it contains a great quantity of spirit, is not apt to produce, in those who liberally partake of it, those appalling effects which succeed an improper indulgence in spirits, and this chiefly arises from the circumstance, that the former nourishes as well as stimulates the frame, whilst the latter does not possess both these properties to the same extent.

It has just been stated, that the too copious abstraction of blood, in inflammation, is not immediately followed by any predominant symptoms of irritability, though they subsequently make their appearance. In acute diseases, the body is naturally weak and delicate, but it retains, for a time, sufficient vigour to produce a general excitement of the animal frame ; hence the nervous system, in such diseases, does not appear particularly affected, but when the morbid action on which this vigour depends, subsides, the impoverished condition of the vital energies becomes strongly manifest in the highly irritable state of the nerves. This phenomenon is, however, explained in a different way, by LOBSTEIN and DESMOULINS.* They attempt to account for it on this principle, that the emaciation, succeeding acute or other diseases, does not extend to the nervous system, and that this is, consequently, enabled to display much greater proportional activity than any other part of the body. This opinion is supposed to be proved by the fact, that experiments made by the hydrostatic balance, shew the nervous system to retain, under such circumstances, its ordinary volume. Were it possible to estimate the vital energies in a diseased state, by the

* *Traité d'Anatomie Pathologique*, p. 71.

greater or less bulk of the organs endowed with them, this method would be decisive, but the principle cannot be established. All parts of the body, in consequence of the difference of their structure, do not certainly admit of the same extent of emaciation, and those, moreover, which are most *essential* to the continuance of life, operate the longest with the greatest *proportional* vigour ; but, though these circumstances will necessarily render the degrees of attenuation in the different organs extremely various, they will not satisfactorily explain all the important changes occurring in the action of the nervous system, since it is sometimes greatly excited when it is not possible to trace the phenomenon to any proportional superiority of matter, nor account for its exhibiting, in many cases of exhaustion, a much higher degree of activity than in robust health. The object of this inquiry being chiefly to point out various relations existing between different symptoms and certain morbid states of the body, it is little affected by theoretical ideas respecting ultimate causes.

The loss of blood by hemorrhage, arising from plethora, is much less apt to produce nervous excitement than when it is the effect of general

emervation. In the latter case, and especially when occurring in females, there is often much derangement of the chylopoietic viscera, as well as great nervous irritability, which is not so exactly proportionate to the loss of the circulating fluid, as to the constitutional disorder resulting from that loss, which is much greater when the hemorrhage has gradually enfeebled the vital powers, than when they are suddenly depressed. In the former, there is not only considerable exhaustion of the animal system, but also a peculiarly morbid condition associated with it, the combination of which is mostly characterised by great nervous excitement; in the latter, however, the exhaustion induced is almost necessarily more simple, being of shorter duration. Purgatives, too, are liable to affect the nervous system in the same manner. They can rarely be given with any decided benefit, or, indeed, without the apprehension of injurious consequences, in nervous affections, or in disorders in which nervous irritability prevails, unless some one of the following symptoms exists, viz., local or general plethora, accumulation of feculent matter in the bowels, or such derangement of them as is indicated by the furred tongue, and by scanty and ill-conditioned evacuations. In any of these morbid

conditions, purgatives are sometimes of the greatest possible efficacy, but when prescribed, as they frequently are, in cases in which those important conditions are partially or wholly wanting, the existing irritability is liable to be greatly aggravated by them. These conditions, and not the nervous symptoms particularly, ought to regulate the selection and application of remedies, but they have not been sufficiently attended to, in consequence, partly of the success which has been stated, on high authority, to succeed the liberal use of purgatives in diseases characterised, more or less, by symptoms of this kind: this inattention has led to many failures in the use of purgatives, and tended to bring them into discredit, though nothing can be more salutary when employed with discretion. In many instances constitutional debility arises from the oppression, or disturbance of the vital powers, a very different thing from exhaustion co-existent with those nervous affections or symptoms, in which the morbid conditions alluded to are frequently absent; in the one case, then, this debility will, perhaps, be removed by the use of purgatives, in the other it will be liable to be greatly increased. As purgatives are injurious in the latter case, it may probably be imagined,

that tonics are calculated to be of great service, and they are certainly suggested by this circumstance ; but it not unfrequently happens that they may be given for weeks in diseases purely nervous, or in those, at least, in which the above morbid conditions do not exist, without producing any apparent effects whatever.

Among other important and frequent causes of constitutional exhaustion, associated with nervous irritability, may be enumerated the unrestricted indulgence of the animal desire, or even the ordinary gratification of it in feeble habits of body. The temperate indulgence of the passion is generally followed by beneficial effects, especially in persons of robust health, and of a decidedly plethoric habit of body, or manifesting a tendency to it ; but in those in whom the nervous system has naturally a marked predominance of action, occurring as it generally does, in the lean and delicate frame, such indulgence is very often attended with injurious consequences, which are almost entirely referrible to the exhausted state of the vital powers. In these the indications of disorder are, a feeling of great lassitude, a sensation of want or sinking about the pit of

the stomach, loss or decrease of appetite, acceleration of the pulse, slight febrile excitement, irritability of mind and of the whole nervous system ; and very often an occasional cough accompanied with expectoration. These symptoms, and the evident sickly appearance of the countenance, are extremely apt to lead to the suspicion of incipient consumption, which is, however, generally proved to be unfounded by a few weeks absence from home. The great debility experienced in these cases certainly arises from the impoverished condition of the animal system, produced in various ways, which may be thus briefly explained :—The indulgence of the animal passion necessarily causes an expenditure of matter, derived from the blood, to form and elaborate which a much greater demand may be made on the vital principles of this fluid than might be supposed from the small quantity of the matter lost, and, therefore, such indulgence must consequently have a tendency to exhaust the powers of life. It is, moreover, an acknowledged fact in physiology, that the increased activity of one organ, by the concentration of vital energy caused by it, commonly enfeebles the action of other organs, or the animal system generally ; hence the undue

exercise of the genital apparatus, its excess, however, depending on the degree of constitutional vigour by which it must be estimated, may be justly regarded as producing considerable functional derangement. There is still another cause of exhaustion, the operation of which is both direct and indirect. The excitement accompanying the gratification of the venereal appetite, powerfully affects the whole of the nervous system, and greatly disturbs its action. The debility thus induced is immediately extended to every part of the animal economy, so that general functional disorder indirectly succeeds the sensual indulgence under the circumstances mentioned. This latter cause is, perhaps, one of the most powerful in exhausting the constitution. It leaves no important organ untouched—no vital action unvitiated. This cause alone, by rendering the appetite delicate and digestion imperfect, will necessarily impoverish the animal system, and from its co-operation with other causes, such impoverishment must be, therefore, in a short time produced, particularly in females, giving rise to a train of symptoms even more various than those just described.

The gratification of the sensual passion is

more frequently a cause of disease than is generally imagined. My own observation, which has been particularly directed to the investigation of this subject, has furnished me with many instances strongly illustrative of the injurious effects of such indulgence on the constitution. Consumption is often produced by it, and the phenomena attending it have sometimes appeared to me, whether (correctly or not, others must determine,) very different from those accompanying that malady when arising from other causes.

In the latter, the affection of the lungs is frequently manifested, though the body generally exhibits the characteristics of health, which continue till it becomes implicated in the local mischief. In the former, the animal economy betrays symptoms of disorder, and the affection of the lungs seems rather to spring out of the general derangement than to occasion it. This difference, if it be well founded, will, of course, demand a proportional modification of treatment. The various cases of the latter description which have fallen under my observation, have appeared much more susceptible of the beneficial operation of the means employed than the others, and this

arises from the difference in the nature of the diseases occurring under circumstances so dissimilar. When the disease is the effect of general derangement or debility it is almost invariably accompanied, from its commencement, with an extraordinary degree of nervous irritability, which is the reverse of what takes place when it originates in the lungs, and is altogether unconnected with constitutional exhaustion. The causes which have produced the pulmonary affection in one instance, have operated directly and with great intensity on the whole of the nervous system, as well as on the vital powers generally, and it is therefore natural to expect, that it would be characterised by a much higher degree of nervous irritability than when, as before remarked, it originates in the lungs and is unconnected with such extensive disorder. A strict attention to these differences has led me to adopt measures in the treatment of the disease, in the one case, which would have been much less successful, if not positively injurious, if employed in the other, though both cases would perhaps have been regarded by persons who had not paid particular attention to such distinctions, as pretty nearly the same.

The undue indulgence of the amative propensity produces, of course, different effects in different constitutions: in some consumption, in others various diseases of the nervous system, and not unfrequently scrofulous affections, attacking the spine, mesenteric, and other glands. The latter class of maladies are, perhaps, the most common. This propensity is sometimes gratified in an unnatural manner by the young, and especially by persons of a nervous temperament and retired habits, who lead sedentary lives; indulgence of this kind is productive of serious mischief to the constitution. The injurious tendency of such indulgence is much greater than that of the natural gratification, not so much from any difference in the mode of gratification, as from the greater degree of it. When the gratification becomes a habit, which it does, particularly in the unnatural mode of obtaining it, it is liable to be carried to a great extent, because there are no difficulties or obstacles whatever in the way of it, and hence, great debility or disease is frequently induced, which neither means nor time can remedy. I have, however, met with several remarkable cases of this description, in which the animal system could not properly be considered in an exhausted state, being scarcely

at all altered in its ordinary appearance, though severe nervous disease existed, yet without indications of any general derangement of the body, which invariably occurs when decided exhaustion exists. In such cases the constitution was naturally possessed of great vigour, and this was, perhaps, the reason that the disease was chiefly restricted to the nervous system, which is always first affected. A less degree of constitutional energy would have been unable to resist its tendency to implicate the whole animal economy.

Exhaustion, associated with great nervous irritability, is frequently observed to succeed parturition, even under circumstances the most favourable, both in respect to the health previously enjoyed, and the ease of the labour itself. The irritability often occurs when it is not possible to discover the slightest symptom of derangement in any of the chylopoietic viscera, the tongue being perfectly clean and moist, the breathing natural, the abdomen quite soft to the touch, and no pain whatever existing in any part of the body. The pulse, however, is small and frequent, or, if not quick, extremely compressible, and copious perspiration breaks out several times in the course of

twenty-four hours, or sometimes continues the whole of this time without any material abatement. These symptoms, with only slight alteration, occasionally last several days. Some might be inclined to attribute the irritability to the shock which the pain and anxiety of parturition are capable of exciting, and which, at times, is certainly great, but the irritability occurs when the birth is not only natural, but effected with great ease. An attentive examination of the changes produced in the animal system by parturition, would, however, lead to the conclusion that this irritability is almost wholly the effect of an exhausted or debilitated state of the vital powers. Gestation is, in most instances, an invigorating cause, giving to the digestive organs greater tone and energy, and to the whole constitution buoyant feelings of health, scarcely enjoyed, perhaps, in an equal degree, at any other time. This salutary effect is produced by the stimulus which the excited functions of the uterus communicate to the whole frame, without which the maternal system would be incapable of furnishing, with safety to itself, sufficient nourishment to the foetus. The expulsion of the foetus is attended by two important changes—*the subtraction of this stimulus, and the return of the abdominal*

viscera to their ordinary relations. These changes have a tendency to give rise to a condition of the animal system characterised by exhaustion or debility, which is, indeed, the source of the nervous phenomena. The sudden alteration in the capacity of the abdominal cavity, and the withdrawal of the stimulus arising from the previously excited functions of the uterus, will necessarily produce great modifications in the sanguiferous system, giving a somewhat *internal* distribution to the blood; hence, inflammation of some of the abdominal viscera is liable to occur after delivery. It must not, however, be supposed that this circumstance alone occasions the urgent feelings of debility, as, in that case, they would quickly be dissipated by the employment of invigorating means, an effect which is rarely produced by them. In proof of the stimulating influence communicated to the powers of life by the increased activity of the uterus during gestation, it is only necessary to mention the change that takes place in the properties of the blood, which, it is well known, acquires a high degree of vitality, as it is evident from its not only coagulating more quickly, and forming a firmer crassamentum than usual, but especially from its exhibiting a buffy ap-

pearance. The circulating fluid losing this highly vitalized condition, on the expulsion of the fœtus, great depression of the animal system succeeds, which, it will scarcely be questioned, arises from a diminution of the vital energies, originating in the manner already explained; and the facility with which the co-existing irritability is removed, compared with the difficulty of lessening it in many of the examples to which allusion has been previously made, strongly favours this opinion.

When the nervous system is affected by causes which act directly upon it, and which disorder the organic functions generally, by slow but prolonged changes in the properties and distribution of the blood, the irritability produced is always tedious and difficult of cure; but when this system is influenced by sudden alterations in the qualities and motion of the vital fluid, which have existed only for a short time, the irritability arising from these alterations is readily removed by re-establishing the natural functions of the circulatory apparatus: whereas, on other occasions, there is also a morbid state of the nerves requiring particular attention, that not unfrequently renders abortive all attempts, however nu-

merous and protracted, to restore health, much less any immediate efforts. The nervous excitement succeeding parturition, arising principally from derangement of the sanguiferous system, requires only greater vigour of constitution to lessen it. Cases of extreme irritability occasionally occur at a somewhat advanced period of life, generally in persons who have been occupied in pursuits that have powerfully exercised the mind or body, and those of this kind that have fallen under my observation have rarely been permanently benefited by any treatment whatever. Persons so affected are generally lean, having a pale or sallow complexion, being melancholy or dejected in spirits, exhibiting an unaccountable degree of restlessness, and a morbidly excited imagination that pictures a thousand bodily evils. The appetite in such persons is often good, indeed, much better than the patient describes it. The bowels are mostly costive, and the evacuations of a darkish colour, but sometimes neither of these symptoms is particularly striking. The abdomen is found, on examination, soft, and by no means painful on pressure being made on any part of it. There is at times a little tenderness about the pit of the stomach. The

pulse is rather quick and small—the body acutely susceptible of cold. Great weakness is always complained of, but some patients, to whom fresh air and exercise were recommended, could walk with ease three or four miles at a time, once every day, if not oftener. The most minute and attentive investigation never enabled me to discover disease in any of the important organs of life sufficient to account for these various and severe nervous symptoms. It appeared as if the body had altogether lost its proper tone and energy, not from any malady local or general, but from a really exhausted condition of the whole frame, gradually induced by mental or physical labour. The wheels of life seemed to move slowly or imperfectly from want of their ordinary springs. These remarks are not intended to apply to phenomena observed in females at the change of life, though at this time there are many nervous symptoms associated with great debility, which, as they are observed in connection with manifest derangement of the chylopoietic viscera, will be subsequently considered.

In the cases alluded to such derangement is

not apparent, or at least not so obviously evident as to sanction the opinion that it occasions the numerous existing symptoms. The exhaustion of the constitution, occurring at an advanced period of life, is often, indeed, characterised by accompanying disease of some of the abdominal viscera, especially the liver; but the disease, in such instances, appears rather an effect than a cause of the impoverished condition of the vital powers, and it may be mentioned, in corroboration of this opinion, that any attempt made to remove the local disorder, and thus re-establish health, is rarely, if ever, attended with any permanent improvement. Such treatment in my own practice, from the amelioration succeeding it in a few of the urgent symptoms, has often, indeed, flattered with hopes of decided success, yet almost as often led to disappointment. The good effected by it was sometimes strikingly evident, the appetite being invigorated, the bodily energies increased, and the feelings generally improved, but a sudden and unexpected change soon occurred, the symptoms becoming aggravated, and the patient, perhaps in the course of a few days, sinking in a manner difficult to be explained.

Nervous irritability is also very commonly produced by acute diseases, which, in conjunction with the remedial measures employed, are the cause of great emaciation. It is contended by some distinguished physiologists, as already remarked, that this state of the nervous system is to be attributed to its predominance at this time, not being considered liable, as the rest of the frame, to any diminution of substance: but were this explanation correct, would not irritability necessarily occur, whenever this difference between the nervous system and the body generally existed, and would not the severity of it always be proportionate to the degree of attenuation induced? It is scarcely necessary to say that such agreement is not observed. Many instances of emaciation might indeed be mentioned, in which irritability is by no means a predominant or well-marked symptom, if by the term irritability be understood, a peculiarly excited condition of the nervous system, apparent from its being morbidly alive to impressions of almost every description. The practical application of this inquiry is, however, very little affected by speculations concerning the final causes of irritability, since it cannot be doubted, that it mostly co-exists with great exhaustion, and

that its permanent cure depends on the removal of this condition.

These remarks on irritability might be very much extended, embracing its particular relations to the seat of acute or local diseases, (since this circumstance, altogether independently of the degree of exhaustion produced, greatly modifies the nervous phenomena) as well as its relations to organic or functional changes, arising from the severity of the diseases—the length of their duration, or the remedial measures which have been employed: these subjects have been hitherto only partly considered, but the further elucidation of some of them will be found in the subsequent Section.

Irritability associated with exhaustion does not, in numerous instances, admit of any important amelioration by any means whatever, and in many, in which it does, the benefit conferred is frequently extremely gradual, arising, moreover, rather from dietetic and other general measures than from any purely medicinal agents. As the treatment proper in such cases is so different from what is required when the irritability depends on simple derangement of

the powers of life, it may be well briefly to explain the causes of this difference, and the line of practice which has been found most advantageous. In emaciation, caused by excessive grief and characterised by great nervous excitement, the symptoms such as almost constant wakefulness, a gnawing or burning sensation at the pit of the stomach, which is very much aggravated by injesta of every description, but especially by fluids ; the loss of appetite, frequent pains in various parts of the body, and constipation of the bowels, are seldom immediately improved to any great extent by tonics, purgatives, anodynes, or external applications, either of a stimulating or sedative kind. The great debility of the system would, perhaps, seem to suggest the employment of tonics, but the most valuable both of the vegetable and mineral kingdom may often be used without, in the slightest degree, invigorating the constitution, even when they do not appear discountenanced by any inflammatory symptom, unless the irritation manifested by the stomach be regarded as such. The numerous capillaries of the digestive organs are, at this time, so disordered, that they perform the functions neither of secretion nor absorption as in health. The derangement of

the former function is evident in the want of appetite, and the character and irregularity of the evacuations ; and that of the latter, though not so manifest, may certainly be deduced from the generally enfeebled state of the circulatory system, and particularly of the capillaries of the alimentary canal. The little success attending the employment of tonics, is, perhaps, principally to be attributed to the non-absorption of them, for were they communicated to every part of the system, as under ordinary circumstances, the probability is, they would invigorate the vital powers, or occasion inflammation, whereas they may be frequently given in considerable quantities without producing either of these effects. Internal sedatives will often allay, though only for a short time, the disagreeable sensations at the pit of the stomach, and it could scarcely be expected that they would exercise a more extensive influence, as they have a tendency to ameliorate only one of the various morbid effects existing, viz., *the irritability of the nervous system, or rather that of the nerves appertaining only to the digestive apparatus*—the object for which they are mostly prescribed. Were they, indeed, given for the purpose of soothing the undue irritability of the nervous system

generally they would fail of success, because this is produced and maintained by a highly excited state of the feelings and great bodily exhaustion, which it is not in their power to correct : they may, however, often be employed with wonderful efficacy in cases of irritability, when it arises rather from a disturbed than an exhausted state of the vital energies. Purgatives are not at all required or proper. The application of leeches and blisters immediately over the *scrobiculus cordis*, is, perhaps, more effectual than any other means in removing the irritation of the stomach, which is almost a constantly annoying symptom ; but, even if it accomplish this, there is little direct benefit conferred upon the animal system, because, as before remarked, this is only one of the numerous morbid effects existing, and, though it may become a cause of others, it is, itself, an effect resulting from great nervous excitement and considerable bodily emaciation ; hence the removal of it cannot be regarded as producing a beneficial change to any extraordinary extent. The consideration of this and other accompanying symptoms, ought not too closely to concentrate our attention on the stomach or any single organ, for, however excellent the local treat-

ment may be, which is liable to be thus suggested, it will be found, that the only permanently successful practice is that which operates on the constitution generally, *such as change of air and situation*, which alone are capable of dissipating the mental excitement and the various morbid effects occasioned by it. When irritability exists in conjunction with exhaustion arising from other causes, (as loss of blood, purging, menstruation, lactation, onanism, or acute diseases,) tonics are not only proper, but are frequently of the greatest possible benefit, though many of the prominent symptoms prevailing under these circumstances differ but slightly in appearance from those produced by excessive grief. The condition of the vital powers varies greatly in cases which thus approximate by certain general relations, the mode and extent of which have been briefly explained in treating, in the foregoing pages, of the several causes of nervous irritability and constitutional exhaustion. The treatment proper to be adopted, can be discovered, indeed, only by an intimate acquaintance with the operation of these causes, for they alone lead to a knowledge of the nature of the existing disease. The light derived from the study of the symptoms them-

selves, is unsteady, fallacious or inefficient. The truth of these observations will, perhaps, be felt, when the numerous diseases situated in the digestive organs have been fully examined. The object of these inquiries is, not to present a complete view of the nature and relations of such diseases, but only to point out in general several morbid conditions characterising an extensive class of them, leaving their more elaborate elucidation to subsequent investigations.

SECT. III.

Irritability of the nervous system arising from, or associated with, great derangement of the abdominal viscera.

THE various conditions of the animal system in which irritability appears, will be admitted as a sufficient reason for the further investigation of this subject. In the foregoing section, irritability associated with exhaustion of the vital powers, and the treatment which my own experience has ascertained to be most beneficial, were briefly considered ; as, however, in that section only one class of phenomena were included, another remains to be examined, equally extensive, interesting and important. Sedentary pursuits, particularly in females, are liable to excite great general derangement, which may be regarded as arising chiefly *from the deteriorated properties of the blood and its irregular distribution.*

The symptoms of disorder springing out of

these general causes are extremely numerous. The countenance is mostly of a yellowish tinge, at times deeply so; the tongue is furred, especially towards the root; the appetite is, in most instances, very defective; and food is apt to produce annoying sensations in the stomach; there are cases in which the appetite is much keener than usual, though the gratification of it occasions disagreeable feelings: flatulence to a distressing degree, sometimes affecting both the stomach and bowels; the latter are generally very costive, and never freely moved, the evacuations rarely having a natural appearance, being mostly of a very dark colour and extremely offensive; the pulse is generally frequent and small, and palpitation of the heart is a very common occurrence. One of the most frequent and striking symptoms of this general derangement of the constitution, is nervous irritability, which, however, differs somewhat in its nature from that originating in exhaustion; in the former case, it is characterised by petulance of temper, and a disposition to regard things with gloomy and desponding apprehension, magnifying to urgent importance the most trivial ailments; in the latter, it also, frequently, though not so

generally, exhibits the same peculiarities : in the former it is, perhaps, less constantly attended with that wakefulness of mind which prevents sleep, or if such wakefulness exists, it is more frequently connected with pain or suffering than in the latter case, being also more readily removed by narcotics. There are still other peculiarities belonging rather to a disturbed than exhausted state of the vital powers evolving irritability : the sleep, in the former condition, is often very much broken by fearful dreams, and the lower extremities are not unfrequently attacked at night by spasms, especially the toes and calves of the legs. These symptoms are often strongly manifested in females under peculiar circumstances, each of which must be accurately examined in order to understand the pathology of the disorders connected with them, as well as fully to ascertain the remedial measures required. When the first appearance of the catamenia is much later than usual, the health is in general greatly disturbed. The secretions are mostly deranged, as is evident from the tongue being more or less furred ; the nature and irregularity of the evacuations ; the dry and occasionally febrile state of the skin.

There is often great pain in the head, particularly at the fore part, as well as in the right hypochondriac and epigastric regions.

The frequent occurrence of epilepsy, hysteria, chorea and spasms, during the tardy or imperfect establishment of the catamenia, indicates a highly morbid state of the nervous system, but how different is the condition of the animal economy co-existing with it from that of pure and decided exhaustion ! It must not be imagined, that this condition is characterised by *one of vigour*, being often, on the contrary, accompanied by considerable debility, which, however, as before remarked, seems to spring out of a disturbed rather than an exhausted state of the vital powers. The animal system being incapable, at the proper time of life, and in regular successive periods, of throwing off by the uterus the superabundance of blood in the system, the ejection of which is essential to health, the circulation is necessarily greatly disordered, the blood quickly becoming *internal* in its distribution and destitute of its ordinary invigorating properties. Hence, the more important viscera of the system are liable to be affected with congestion, and the various morbid alterations con-

sequent upon it. The circulating fluid cannot be thus internally distributed without leading to the imperfect performance of the functions of life, and necessarily causing debility, which, in numerous cases, is associated with decided engorgement of the internal capillaries, and not with that degree of exhaustion of the constitution, indicated by any extraordinary deficiency of the vital fluid. The knowledge of this condition of the capillaries and of the causes of it, could not fail to suggest a rational mode of treatment, which would probably be, in many respects, much more efficient than the one generally employed. This state of the circulatory system is, however, much more evident when the catamenia are suddenly arrested by cold, depressing emotions, or other causes. The first symptoms that appear are slight and unimportant, but in a few weeks, or months, are followed by others of a more aggravated character. The head is severely affected with pain; or the organs of the chest or abdomen, are greatly disordered. The greatest possible variety of symptoms are evolved in different females, and even in the same during the continued suppression of the catamenia. The numerous symptoms have, how-

ever, one common origin, viz., *the derangement of the circulatory system*, which of course affects different parts of the body in different degrees, according to their natural or acquired susceptibility. The abdominal viscera are first most generally and extensively disordered; next, the organs of the chest, and lastly the brain. The greater liability of the former to be disturbed, arises from the tendency of the blood to accumulate in them *from the functions, structure and situation of the viscera, as well as from the frequency of their derangement—circumstances which will at once be admitted as giving them a peculiar susceptibility of congestion*. The delicate and important nature of the functions performed by the heart and lungs renders any disorder in them soon evident: cough, difficulty of breathing and pain in the chest, are symptoms easily produced and quickly discovered; but the indications of disease in the abdominal viscera, when comparatively insignificant, are not so apparent to ordinary observation. The vicinity of the heart and lungs to those viscera, and the facility with which they are disordered by any impediments to the circulation of blood in them, satisfactorily explain the frequency of their implication. The nervous irritability existing at this time.

is sometimes exceedingly distressing. The anxiety of the patient is strongly depicted in the countenance; the whole body is easily agitated, and the spirits are very much depressed. It has already been remarked, that though the mind is not so decidedly excited at night, as in cases of irritability arising from exhaustion, it is nevertheless, greatly so, and its slumbers are frequently disturbed by painful dreams. This latter symptom is extremely common, being generally found to prevail whenever the functions of the chylopoietic viscera are similarly deranged, though by very different causes. There is pain at the pit of the stomach, and often over the greater part of the abdomen, sometimes acutely felt on pressure being made in these situations, and the appetite, though variable, is rarely good, being, however, generally less impaired than in cases of exhaustion; the pulse is frequent, small and easily compressed; the tongue is mostly furred, and in many instances to a great extent. This is a highly important symptom, as considerable practical experience has convinced me, its absence or presence being alone calculated to modify greatly the treatment employed. The morbid conditions of the body co-existing at this time with nervous

irritability, undoubtedly arise from a deterioration and irregular distribution of the blood, the prolonged continuation of which necessarily occasions much general as well as local disease.

Since such disease, as already remarked, varies greatly in its nature in different individuals, and, indeed, in the same individuals at different times, it may not be uninteresting to endeavour to investigate the causes of such diversities. When the catamenia are suddenly suppressed by cold or mental emotions, in females of the sanguineous temperament, considerable disorder of the animal system succeeds in consequence of the abundance and highly vigorous properties of the circulating fluid being greatly disturbed by such suppression. Acute inflammation of the lungs or abdominal viscera is thus occasionally produced, or, at least, that morbid state of the frame which gives rise to inflammatory or typhoid fevers. Even when these effects do not take place, the existing symptoms indicate, in a very unequivocal manner, various local determinations of blood. The head is almost invariably affected with severe pain, more frequently at the fore and upper part

than in any other situation, the eyes and the whole countenance have a dull heavy expression, and the patient complains of great languor or inability to move. It will also be found, on examination, that the respiration is by no means performed with its natural facility and completeness, though of this the individual is frequently insensible until awakened to a knowledge of it by bodily exertion; there is pain in some part of the abdomen, which is, at times, acutely felt on pressure being made about the pit of the stomach, or immediately over the region of the liver; the urinary bladder is, also frequently in an irritable condition, so that its contents are not only often evacuated, but with disagreeable sensations, and the urine, if allowed, to remain at rest a few hours, not unusually deposits a copious sediment.

In constitutions of this temperament hysteria very frequently occurs. This affection is undoubtedly liable to make its appearance under such circumstances, in all the different temperaments, but, with the exception of the bilious, in none so *immediately* on the disturbance of the uterine functions, as in the sanguineous; and it may be further remarked, that the derangement of these important func-

tions causes less permanent disease in the latter than in any other habit of body. This temperament is not characterised by a high degree of sensibility, rendering the whole animal frame painfully alive to morbid impressions, and having a tendency to maintain them long after the primary exciting causes have ceased to operate, but it manifests great activity of the circulatory apparatus, the energies of which, if properly aided, readily re-establish the natural actions of the vital powers. In the nervous temperament the early symptoms of disease and their progress are decidedly different. The sudden suppression of the catamenia in this temperament, does not so *immediately* and so strikingly affect the vital powers as in the vigorous and highly plethoric. The tendency of the disorder induced is not to evolve acute inflammation in the chest or abdomen, nor even low typhoid fevers, but, on the contrary, by slow and gradual degrees to cause disorganization in those viscera which are most materially deranged. The anxious expression of the features, the tremulous motion of the body on the slightest agitation, and the various disorders of which the patient complains, originating in the brain, spinal cord or ganglionic

system of nerves, and very often co-existing in the whole of them, prove that the nervous system is most powerfully affected. The head is almost constantly attacked by acute and distressing pains, and these are occasionally so urgent as to demand very active remedial measures, but it has seldom appeared to me that the free abstraction of blood was of any permanent benefit. The lumbar portion of the spine is, also, the seat of dull or severe pains, and manifests sensibility on pressure if the disturbed condition of the uterus continue for any lengthened period, and ultimately the whole spine frequently becomes similarly disordered, as every practitioner must often have observed. The disease of the nervous system, as well as the disturbed state of the vital powers generally, is occasioned by the internal distribution of the blood. An attentive examination of the animal frame, antecedent to the evolution of such strikingly morbid symptoms, will prove that the internal capillaries are suffering from an undue proportion of the circulating fluid: if, however, the evidence in favour of this fact, be, at that time, somewhat equivocal, the gradual manifestation of disease, in different parts of the animal system, will fully establish it. A

knowledge of this fact will scarcely fail to suggest just and energetic measures when the prevailing symptoms may be easily obviated.

The prolonged disturbance of the uterine functions in the nervous temperament very frequently gives rise to hysteria and epilepsy, though they do not appear so *immediately* to succeed this disturbance as in the sanguineous temperament, perhaps, from this circumstance, that in the former, the sudden suppression of the accustomed evacuation, does not so strongly affect the whole of the vital powers as in the latter, in consequence of *the constitution possessing less inherent tone and vigour*,* but when the diseases do occur, they are often difficult of cure, because severe structural or functional

* It will, undoubtedly appear to some a very paradoxical opinion, that the delicate constitution should be less *immediately* disturbed by the sudden suppression of the catamenia, than the one possessing decided tone and vigour : but it may be urged in support of this opinion, that, in the vigorous constitution, the circulating fluid greatly abounds, endowed with highly stimulating properties, so that, when suddenly disordered in its distribution, it will have a tendency to give rise to morbid affections, because such a constitution is, under these circumstances, peculiarly predisposed to them.

The changes, indeed, produced in the condition of the sanguiferous system are much greater in this than in the one in which this system naturally exercises a less degree of influence, or in other words, in which it is not the predominant system of the body.

changes exist before such diseases manifest themselves. Many cases of this description have fallen under my own observation. When the nervous system is thus disordered, considerable disease is frequently evident, in the abdominal and thoracic viscera. Cough, shortness of breath, and pain in some part of the abdomen are seldom absent; the alvine evacuations being, at the same time of an irregular and unhealthy kind. Such cases very often terminate in consumption, and one of the peculiarities distinguishing them, is their long continuance, as they sometimes last, with slight alleviation, for years. Another peculiarity is the diseased condition of the more important abdominal viscera, co-existing with the decided pulmonary affection. Such general disease, may, and indeed, often does take place, when phthisis cannot be traced to the suppressed evacuations of the uterus, but my own experience scarcely furnishes a single striking exception to the occurrence of such extensive disease under the circumstances previously specified.

The thorough conviction, that consumption, occurring in these cases, as well as the very general disease accompanying it, are altogether

attributable to the congestion of the internal capillaries, originating in the disturbance of the uterine functions, and not in any predisposition of the animal system to these morbid deteriorations, has induced me, on numerous occasions, to employ, and often with the happiest results, active remedies, *the tendency of which is to equalize the circulation*. A remarkable case of this kind happened in my practice about four years ago, in a young lady of the nervous temperament. The head, chest and abdomen were extensively disordered. It seemed difficult to decide ~~to~~ which remedial measures should be particularly applied. The practitioner, first in attendance, had directed his treatment principally to the head, in consequence of the very distressing pains which the patient suffered. Leeches, blisters and cupping had been very freely employed, but which, without much improving the symptoms, caused great debility. She had a short and occasional cough, with hurried breathing on slight bodily exertion. The derangement of the lungs appeared evident from the following remarkable symptom. She could not take a deep inspiration without fainting, and the fit lasted a considerable time, during which she remained altogether insensible.

This phenomenon may be thus easily explained : the lungs were greatly congested, and the heart was, at times, acting with difficulty in consequence of receiving more blood than it was capable of transmitting without giving rise to palpitation, which frequently occurred. *The deep inspiration had undoubtedly a tendency to draw more blood to the lungs, and consequently to convey to the heart an additional quantity, which, arresting its action, necessarily caused syncope.* She had, also, pain, on pressure, over the greater part of the abdomen. These symptoms had continued with greater or less severity, for six months previous to my attendance. Viewing the case as strongly illustrative of general internal engorgement, eventually producing structural changes, I prescribed emetics, which were repeated at least once a week, for several successive weeks, for the purpose of equalizing the distribution of blood. In two months an extraordinary degree of improvement was effected in all the symptoms and the patient ultimately recovered. Other remedies were employed, such as aperients and tonics, in different stages of the disease, but the important ameliorations were clearly referrible to the influence of emetics.

The nervous irritability, and the disordered condition of the animal system caused by the sudden suppression of the catamenia, are also frequently observed with certain differences, when the functions of the uterus cease from being no longer necessary for the purposes for which they were designed by nature. The differences arise from considerable debility often existing at this period of life. The constitutions most liable to be disturbed by this important change are, the phlegmatic and the leuco-phlegmatic, which are characterised by a deficiency of vital energy. The prevailing symptoms vary from those previously described in *the frequent occurrence of spasms attacking the lower extremities, and sometimes, also, the upper; and the excruciating pains about the pit of the stomach or in the chest, commonly called spasmodic.* These spasms arise entirely from the poverty and irregular distribution of the blood.

In all these cases the veins are unusually large, clearly shewing the great debility of the sanguiferous system, and it may also be remarked, that in proportion as this system is invigorated, the spasms are relieved. There is, perhaps, another difference of some importance which

ought to be kept in view, viz., that the bowels are mostly deranged from the accumulation of feces, which is sometimes exceedingly great. Few cases have occurred to me in which derangement thus produced did not exist. The very evident functional disorder existing in the head, chest or abdomen, and sometimes, perhaps, at the same time, in all of them, only slightly differs in its general character from that which is very frequently observed on the suppression of the catamenia. The morbid effects, however, which this disorder, if not relieved, produces, bear little resemblance to each other under these different circumstances. The disturbance of the vital powers, occasionally attendant on the cessation of the menses, has no particular tendency to excite hysteria, epilepsy, or acute inflammations, but is calculated by slow and gradual progress eventually to destroy the vital energy of the constitution, in consequence of the congestion or chronic inflammation, affecting the important functions of life.

Dropsy, apoplexy, paralysis and imbecility of mind, may be mentioned as a few of the most usual effects which this congestion and inflammation are apt to produce : the con-

stitution, however, sometimes breaks up somewhat suddenly, and declines without any of these effects being strongly manifested, the vital powers appearing to have lost altogether the power of acting, and the susceptibility of being invigorated. Nervous symptoms often exist to a greater extent on the cessation than on the suppression of the catamenia: the spirits of the patient in the former case, are always exceedingly depressed, being affected by the slightest causes, which produce violent palpitation of the heart, as well as agitation of the whole body, and her nights are invariably restless.

Nervous irritability is frequently associated with a disturbed condition of the chylopoietic viscera, arising principally from unwholesome food, or the constant breathing of impure air in filthy and ill-ventilated situations, each of which has pretty nearly the same injurious influence on the vital powers, since it is *the tendency of both to deteriorate the properties of the vital fluid*. They may differ in the mode in which they act, but the ultimate effect produced by them is the same, and conjoined, as it necessarily is, with considerable derangement of the secretory organs, it must inevitably

lead to local congestions. The pulse, in cases of this kind, is feeble, though not particularly frequent until gastric irritation becomes extremely evident; and the tongue is more generally furred, and to a greater degree than in the cases previously considered. The head, chest, and abdomen, are occasionally affected, as on the cessation and suppression of the catamenia: in the greater number of instances, however, the abdominal viscera are the seat of the principal disease, and next to these, the organs of the chest are most frequently implicated. As prevailing morbid indications are very similar to those already enumerated, it is not necessary to describe them. It may, perhaps, be proper to remark, that spasms of the lower extremities, as well as pains about the pit of the stomach, which are commonly regarded as spasmodic, or at least very often designated as such, are occasionally prominent symptoms. It will be found, on a patient examination of the animal system when thus affected, that the numerous nervous symptoms are chiefly referrible to the functional disorder of the chylopoietic viscera, originating in the derangement of the circulatory apparatus, the nature of which has been more particularly stated in the foregoing pages.

Nervous irritability is sometimes exceedingly distressing in females, who, in consequence, perhaps, of their being rather corpulent, do not appear debilitated : such females, however, are excellent examples of the phlegmatic and leuco-phlegmatic temperaments, which possess, even in health, but a low degree of vital energy, and hence it is probable that, in functional disturbance of the animal system, they will be greatly deficient in tone and vigour. Persons so affected are generally found among the lower classes of society, who, if not, as is often the case, exposed to unwholesome air, or deprived of proper food, are yet liable to great bodily fatigue and close confinement to domestic duties, which impoverish the vital energies, and induce derangement of the chylopoietic viscera.

A small and frequent pulse, which, when not frequent, is easily compressed; cold extremities; a difficulty of maintaining an agreeable degree of warmth in the body; an occasional occurrence of spasms, and a decided want of activity in the organic functions, are symptoms which strongly indicate constitutional debility. Though the nervous irritability evolved during the existence of these

symptoms is rarely associated with the same apparent degree of functional disorder, as when it arises from breathing deleterious air, or living on unwholesome food, such disorder is, nevertheless, always evident, and the nervous symptoms originating in it, are often much more tedious and difficult of cure than when they are connected with more manifest disease, a circumstance which may perhaps arise from differences in the temperaments in which this disorder occurs. The inherent debility in the phlegmatic and leuco-phlegmatic temperaments, renders it no easy matter to correct the existing morbid symptoms, in consequence of the great difficulty of invigorating the vital energies which are very much depressed. In many of these cases the nervous symptoms are undoubtedly produced by the smoking of tobacco—a practice which is sometimes carried to excess by females in the working classes of society—the injurious tendency of which, is often apparent in delicate or impoverished constitutions.

The influence of the mind, in causing nervous irritability, which was considered in the foregoing section, occasionally gives rise to symptoms different, in some respects,

from those detailed, not being so strikingly conjoined with exhaustion of the vital powers as with the simple derangement of them. When the mental impression is not exceedingly acute, or of long duration, the irritability produced, seems to spring directly out of the evidently existing functional derangement, characterised by symptoms of dyspepsia, and ceases on the removal or diminution of the exciting cause. Were the symptoms, however, to be acute, or to last long, many of them would gradually disappear, and the irritability of both mind and body would become proportionately more urgent, appearing to originate less in the morbid condition giving rise to the general symptoms of indigestion, than in some particular affection of the nervous system.

After these observations on nervous irritability, associated more intimately with a disturbed than an exhausted state of the functions of organic and animal life, it may be well, briefly to allude to a few of the remedial measures which my own individual experience has found most efficient in the treatment of some of the cases considered in this section. When the catamenia are late in appearing,

and prevailing symptoms indicate local congestion, the occasional use of emetics, the warm bath, friction, with stimulating embrocations along the spine, and the daily employment of the skipping rope, are, perhaps, the most energetic and salutary remedies which can possibly be employed. Of these remedies, emetics are unquestionably the most valuable. They more immediately equalize the broken balance of the circulation, than any other, and, as they excite to increased action every part of the animal system, the uterus necessarily participates in the improvement, and acquires sufficient energy to perform its essential functions. The remedies usually prescribed are tonics, particularly the various preparations of iron, but the most powerful of these are feeble in their operation, compared with emetics. The latter, by acting strongly on the respiratory organs, infuse new life and vigour into every part of the body, as is fully evident from their producing generally, through the whole system, a more equable degree of animal temperature. By exciting these organs, the circulation and properties of the blood are speedily improved, by which the internal congestion is relieved, wherever it may be situated;

new tone and vigour being thus communicated to the organs which absorb, secrete, assimilate, or perform any other office. The same mode of treatment is equally beneficial in cases of sudden suppression of the catamenia.

When the suppression is recent, and the functional disorder induced, though general, only slight, very ordinary means are mostly sufficient to correct it. The aid of energetic measures is required only when the uterine secretion has been arrested many months, and there is strong evidence that structural changes are taking place in some of the more important organs : the lungs exhibiting, perhaps, the symptoms of incipient phthisis, accompanied, moreover, with considerable disease of the abdominal viscera, as manifested by enlargement of the liver, an extremely torpid state of the bowels, the unhealthy character of the evacuations, and acute sensibility on pressure made over any part of them. These general symptoms are almost invariably accompanied by the furred tongue, a disagreeable taste in the mouth, and great defect of appetite, as well as distressing pains in the head. Leeches and blisters applied to

the chest or abdomen, and internal remedies of a soothing nature, will often dissipate, for a short time, many of the annoying symptoms, but they very seldom effect a radical cure. In such cases the occasional use of antimonial emetics, given once or twice a week for a month, or a longer period, according to the urgency of the disorder will, in most instances, entirely remove the numerous symptoms, or, at least, so far diminish them as to render admissible the employment of tonics, such as gentian, calumba, or quinine. Long previous however, to the use of these remedies, it is advisable to give small doses of emetic tartar, not for the purpose of causing vomiting or producing an unpleasant degree of nausea, but to allay the pulmonary affection. Three grains of it to eight ounces of water, with two drams of the sulphate of magnesia, is a form in which it may be conveniently prescribed, two table spoonfuls being taken three or four times a day. My partiality to the employment of this remedy may, in part, arise from the very beneficial effects I saw result from it in the practice of LÆNNEC, not perhaps, in cases exactly of this kind, but more especially in decidedly inflammatory diseases; my experience, however, strongly substantiates its effi-

cacy in the treatment of the general disorder occasionally manifested on the abrupt suppression of the catamenia. The same practice is not equally salutary in extensive functional disease, originating in the changes of the animal system, connected with the cessation of the menses, though many symptoms in both cases have a strong resemblance to each other. Emetics may often be used with advantage in cases of the latter description, especially if cough, difficulty of breathing, and pain in the chest exist, but if the abdomen is the seat of the principal disease, the application of leeches and blisters, with the almost daily employment of injections, composed of castor oil and the spirits of turpentine, in the proportion of half an ounce each to a pint of gruel, is a mode of treatment not only safe but extremely successful. The purgatives employed must be slightly stimulating in their nature. The vital powers should be roused at the same time that the bowels are relieved of the feculent matter which disturbs their functions, either from its undue accumulation, or unhealthy qualities. Leeches, blisters, and injections will mostly remove the urgent symptoms, whether situated in the head, chest or abdomen, or co-existing in the whole of

them, which is by no means an unusual occurrence. As soon as the bowels appear to have been sufficiently moved, tonics, especially quinine, should be given in pretty liberal doses, and it may, perhaps, be well to prescribe at night three grains of blue pill, and the same quantity of the extract of hyoscyamus and of colocynth, until the alvine secretions display their natural appearance. As it is not my intention, at this time, to enter into a full consideration of the principles of practice applicable to these or any other cases of disease, the investigation of them must be regarded as only general, and at present incomplete.

APPENDIX.

NOTE A., PAGE 317.

The following definition of animal heat is given in the “Experimental Inquiry into the Laws of Life :”—Animal heat is not in the direct ratio of the quantity of oxygen inhaled, but in the inverse ratio of the quantity of blood exposed to this principle.” This definition is very faulty : it does not express the exact views I entertained, and which, indeed, are clearly stated in many passages of the “Experimental Inquiry,” as, for example, in page 34, “This principle” (animal heat) “is proportionate to the chemical changes in the lungs, and the perfection of all other functions is, also, in the direct ratio to these.” In all my experiments and observations it seemed pretty evident, that the less the quantity of blood existing, at any one moment, in the lungs, the greater was the production of animal heat, and the greater the quantity of blood, the less was the production of animal heat : it ought, therefore, to have been stated in the definition, as it is distinctly afterwards in the body of the work, that the chemical changes in the former condition, are greater than in the latter, in consequence of a *greater quantity of oxygen being converted into carbonic acid gas*, but instead of this meaning being clearly conveyed, the converse of it appears to be stated.

It has been proved that when the lungs are exceedingly congested, *a considerable quantity of oxygen disappears in respiration*, which certainly does not produce its ordinary chemical effects, otherwise the temperature of the body would not be so greatly reduced as it is. Hence it appears that though animal heat is unquestionably proportionate to the

chemical changes in the lungs, a considerable quantity of oxygen, may, in certain states of the lungs, disappear, without producing chemical changes proportionate to the quantity inhaled —changes which would be caused by it, *had it less blood at any one moment to act upon*. The faulty definition originated in my not sufficiently attending to this distinction, but it had no injurious effect on the general reasoning employed in the “ Experimental Inquiry:” the improved definition may, indeed, be substituted without rendering it necessary to introduce any modifications whatever into the mode of reasoning generally adopted, or the physiological principles laid down in the work.

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